

### CERTIFICATION OF TRANSLATION

I, *Yeon-ju Ryu*, an employee of Y.P.LEE, MOCK & PARTNERS of Koryo Building, 1575-1 Seocho-dong, Seocho-gu, Seoul, Republic of Korea, hereby declare under penalty of perjury that I understand the Korean language and the English language; that I am fully capable of translating from Korean to English and vice versa; and that, to the best of my knowledge and belief, the statement in the English language in the attached translation of *Korean Patent Application No. 10-2002-0075303* consisting of 59 pages, have the same meanings as the statements in the Korean language in the original document, a copy of which I have examined.

Signed this 4th day of January 2007



---

## ABSTRACT

### [Abstract of the Disclosure]

5        Provided are an information storage medium on which information on a drive and  
information on the state of a disc is recorded in a zone of a recordable area and a  
method of recording information on the information storage medium. The information  
storage medium (a disc) includes an area and a user data area. The area includes a  
recordable zone having a drive & disc zone in which information on a drive and  
information on a state of the disc is recorded. The drive & disc zone includes a  
10    plurality of physical clusters or ECC blocks and the information on the drive and the  
information on the state of the disc is recorded in the same physical cluster or ECC  
block or different physical clusters or ECC blocks.

### [Representative Drawing]

15        FIG. 2

## SPECIFICATION

[Title of the Invention]

5        INFORMATION STORAGE MEDIUM AND METHOD OF RECORDING  
INFORMATION THEREON

[Brief Description of the Drawings]

10        FIG. 1 illustrates the data structure of a lead-in or lead-out area according to the  
present invention.

FIG. 2 is a view for explaining an information storage medium and a method of  
recording information thereon according to a first embodiment of the present invention.

15        FIG. 3 is a view for explaining an information storage medium and a method of  
recording information thereon according to a second embodiment of the present  
invention.

FIGS. 4A and 4B are views for explaining an information storage medium and a  
method of recording information thereon according to a third embodiment of the present  
invention.

20        FIG. 5 illustrates information on a drive and on the state of a disc, the information  
being recorded in a drive & disc zone of an information storage medium according to  
the present invention.

FIGS. 6A and 6B are views for explaining an information storage medium and a  
method of recording information thereon according to a fourth embodiment of the  
present invention.

25        FIGS. 7A and 7B are views for explaining an information storage medium and a  
method of recording information thereon according to a fifth embodiment of the present  
invention.

FIGS. 8A, 8B, and 9 are views for explaining another example of the fifth  
embodiment of the present invention.

30        FIGS. 10A through 10C are views for explaining examples of an information  
storage medium and a method of recording information thereon according to a sixth  
embodiment of the present invention.

FIGS. 11A through 11D are views for explaining state address information recorded on an information storage medium according to the present invention.

FIGS. 12A and 12B each illustrate a last recorded address of a user data area and a last replaced address of an outer spare area for defect management.

5        FIGS. 13A and 13B are views for explaining the outer spare area shown in FIGS. 12A and 12B.

FIGS. 14A through 14D are views for explaining examples of a format of state address information.

10        < Explanation of Reference numerals designating the Major Elements of the Drawings >

5: read-only zone                      10: recordable zone

10a: defect management area        10b: control data zone

10c: OPC test zone                    10d: drive & disc zone

10e: buffer zone

15        10-0, 10-1,...,10-n: physical cluster or ECC block

10-0-0, 10-0-1: 10-0-2,..., 10-n-0, 10-n-1,..., 10-n-m: recording unit

[Detailed Description of the Invention]

[Object of the Invention]

20        [Technical Field of the Invention and Related Art prior to the Invention]

The present invention relates to an information storage medium on which information on a drive and information on the state of a disc is recorded in a zone of a recordable area and a method of recording information thereon.

25        When a 4.7GB digital versatile disc-random access memory (DVD-RAM) is loaded into a drive, information on the drive, e.g., information on the drive maker, a serial number, and so forth, is recorded in a rewritable identification zone of a lead-in area of the disc. A 20GB high-density (HD)-DVD also has a lead-in area including a drive zone with a plurality of physical clusters so as to record information on a used drive in the drive zone.

30        In particular, since information is recorded only once in an optimum power control (OPC) zone necessary for testing a disc or a drive information zone of a once-writable information storage medium, the once-writable information storage medium requires updated information on its state as well as information on a used drive so that the drive

can rapidly access the once-writable information storage medium when recording additional user data in unrecorded zones after recording user data.

Accordingly, a method of efficiently recording new information regarding a new drive and state of the disc should be proposed to satisfy a new format of an information  
5 storage medium.

#### [Technical Goal of the Invention]

The present invention provides an information storage medium on which information on a drive and information on the state of the medium can be recorded in a  
10 zone composed of a plurality of error correcting code (ECC) blocks or physical clusters, so that the drive can rapidly access the medium using the recorded information and user data can be efficiently recorded and/or reproduced, and a method of recording information thereon.

#### 15 [Structure and Operation of the Invention]

According to an aspect of the present invention, there is provided an information storage medium (a disc) including an area and a user data area. The area includes a recordable zone having a drive & disc zone in which information on a drive and information on a state of the disc is recorded. The drive & disc zone includes a  
20 plurality of physical clusters or ECC blocks and the information on the drive and the information on the state of the disc is recorded in a physical cluster or ECC block.

Whenever the information on the drive and the information on the state of the disc is updated, the updated information is recorded in a physical cluster or ECC block different from a physical cluster or ECC block in which information on a previous drive  
25 and information on a previous state of the disc is recorded, particularly in a physical cluster or ECC block following a physical cluster or ECC block in which information on a last drive and information on a last state of the disc is recorded.

Each of the plurality of physical clusters or ECC blocks comprises a plurality of recording units, and the information on the drive and the information on the state of the  
30 disc may be sequentially recorded in different recording units or the same recording unit of a physical cluster or an ECC block.

It is preferable that information on a new drive and information on a latest state of the disc is recorded in a starting recording unit of the physical cluster or ECC block, and

then the information on the drive and the information on the state of the disc is copied into a recording unit right after the starting recording unit.

According to another aspect of the present invention, there is also provided an information storage medium (a disc) including an area and a user data area. The area  
5 includes a recordable zone having a drive & disc zone in which information on a drive and information on a state of the disc is recorded. The drive & disc zone includes a plurality of physical clusters or ECC blocks and the information on the drive and the information on the state of the disc is recorded in different physical clusters or ECC blocks.

10 The information on the drive and the information on the state of the disc are sequentially and alternately recorded starting from a beginning part of the drive & disc zone. Alternatively, the drive & disc zone may be divided into two zones, and one of the information on the drive and the information on the state of the disc may be recorded in a first zone of two zones and the remaining information may be recorded in  
15 a second zone of two zones.

The information on the state of the disc may include at least one of an address of a zone in which new OPC data is recorded, an address of a zone in which information on a last drive and information on a latest state of the disc is recorded, a last recorded address of a zone in which user data is lastly recorded, information on the number of  
20 sessions, write protection information, information for indicating whether additional user data is recordable after recording user data, and information necessary for indicating an address of a zone in which information on a subsequent drive and information on a subsequent state of the disc is to be recorded or information necessary for indicating an address of a zone in which user data is to be recorded.

25 According to still another aspect of the present invention, there is also provided a method of recording information on an information storage medium (a disc). Information on a drive and information on a state of the disc is recorded in one of a plurality of physical clusters or ECC blocks of a drive & disc zone of a recordable zone included in an area except a user data area. Information on a new drive and  
30 information on a latest state of the disc is recorded in a physical cluster or an ECC block different from a physical cluster or an ECC block in which the information on the drive and the information on the state of the disc is recorded whenever the information on the drive and the information on the state of the disc is updated.

According to yet another aspect of the present invention, there is also provided a method of recording information on an information storage medium (a disc). Information on a drive and information on a state of the disc is recorded in different physical clusters or ECC blocks of a plurality of physical clusters or ECC blocks of a drive & disc zone of a recordable zone included in an area except a user data area. Information on a new drive and information on a latest state of the disc is recorded in a physical cluster or ECC block different from a physical cluster or ECC block in which the information on the drive and the information on the state of the disc is recorded whenever the information on the drive and the information on the state of the disc is updated.

According to yet another aspect of the present invention, there is also provided a method of recording information on an information storage medium (a disc). Information on a state of the disc and information on a drive is recorded in one of a plurality of physical clusters or ECC blocks of a drive & disc zone of a recordable zone included in an area except a user data area. Updated information on the state of the disc and updated information on the drive is recorded in a physical cluster or an ECC block following the physical cluster or the ECC block in which the information on the state of the disc and the information on the drive is recorded. The information on the drive is copied after recording the updated information on the drive.

The updated information on the state of the disc is recorded in a 0<sup>th</sup> recording unit of a predetermined physical cluster or ECC block, the updated information on the drive is recorded in a first recording unit right after the 0<sup>th</sup> recording unit, and the information on the previous drives is sequentially copied into recording units after the first recording unit.

The updated information on the drive is recorded in a 0<sup>th</sup> recording unit of a predetermined physical cluster or an ECC block, the information on previous drives is sequentially copied into recording units after the 0<sup>th</sup> recording unit, and the updated information on the state of the disc is recorded in a recording unit right after a last one of the recording units into which the information on the previous drives is copied.

The updated information on the drive is recorded in a 0<sup>th</sup> recording unit of a predetermined physical cluster or an ECC block, the information on previous drives is sequentially copied into recording units after the 0<sup>th</sup> recording unit, and the updated

information on the state of the disc is recorded in a recording unit right after a last one of the recording units into which the information on the previous drives is copied.

According to yet another aspect of the present invention, there is also provided a method of recording information on an information storage medium (a disc). Whenever  
5 information on a state of the disc is updated, the updated information on the state of the disc is recorded in different physical clusters or ECC blocks of a plurality of physical clusters or ECC blocks of a drive & disc zone of a recordable zone included an area except a user data area. Updated information on a drive is selectively recorded in a  
10 physical cluster or an ECC block in which information on the state of the disc is recorded.

When the updated information on the state of the disc is recorded in a starting recording unit of a predetermined physical cluster or ECC block and the updated information on the drive is not recorded, information on a previous drive is copied into a recording unit following the starting recording unit.

15 When the updated information on the state of the disc is recorded in a last recording unit of a predetermined physical cluster or ECC block and the updated information on the drive is not recorded, the information on the previous drives is sequentially copied starting from a beginning recording unit of the predetermined physical cluster or ECC block.

20 Hereinafter, an information storage medium (a disc) and a method of recording information thereon according to the present invention will be described in detail with reference to the attached drawings.

FIG. 1 illustrates the physical structure of a lead-in area having a predetermined diameter starting from the central hole of an information storage medium (a disc)  
25 according to the present invention. The lead-in area includes a read-only zone 5 in which data is pre-recorded and a recordable zone 10. Disc-related control data is pre-recorded as pits or high frequency wobbles in the read-only zone 5 when manufacturing the disc and is only readable.

The recordable zone 10 includes a defect management area 10a in which  
30 information necessary for handling and managing defects on the disc is recorded, a control data zone 10b, an OPC test zone 10c in which information necessary for optimally controlling a power is recorded, and a buffer zone 10e.



Here, the recordable zone 10 further includes a drive & disc zone 10d in which information on a drive and information on the state of the disc is recorded. The drive & disc zone 10d is composed of a plurality of physical clusters or ECC blocks, each of which may be composed of a plurality of recording units such as sectors or data frames.

5       The information on the drive includes information on a manufacturer, manufacturing company-related information, a manufacture number, a serial number of the drive, and so forth.

10       The information on the state of the disc includes at least one of an address of a zone in which new OPC data is recorded, an address of a zone in which information on a last drive is recorded, a last recorded address of a zone of a user data area in which user data is lastly recorded, information on the number of sessions, write protection information, and information for indicating whether additional user data is recordable in a user data area after recording write user data.

15       The information on the state of the disc may include state address information. The state address information contains state information including information on a recording mode, the type of a file system, and a recording layer on which user data is recorded, the last recorded address of the zone of the user data area in which user data is lastly recorded, and a last replaced address of a zone of an outer spare area in which data is replaced to manage defects on the disc.

20       According to the present invention, information on the drive and the information on the state of the disc is recorded in the drive & disc zone 10d of the disc having the plurality of physical clusters or ECC blocks. In this case, each time information on a new drive is recorded and the information on the state of the disc is updated, the information is recorded in a physical cluster or ECC block different from one of the plurality of physical clusters or ECC blocks in which the information on the previous drive and the information on the previous state of the disc is recorded. In particular, it is preferable that whenever information on a new drive is recorded and the information on the state of the disc is updated, the information on the new drive and the updated information on the state of the disc is recorded in a physical cluster or ECC block following the physical cluster or ECC block in which the information on the previous drive and the information on the previous state of the disc is recorded. The drive & disc zone 10d may be included in each of the areas except the user data area. For example, the drive & disc zone 10d may be included in at least one of the lead-in area

and a lead-out area (not shown). The lead-out area may have a similar structure to the lead-in area.

Referring to FIG. 2, the drive & disc zone 10d of an information storage medium (a disc) according to a first embodiment of the present invention may include  $n+1$  physical clusters or ECC blocks ranging from a 0<sup>th</sup> physical cluster or ECC block 10-0 to a  $n^{\text{th}}$  physical cluster or ECC block 10- $n$ . Each of the  $(n+1)$  physical clusters or ECC blocks may be composed of a plurality of recording units such as sectors or data frames. Hereinafter, only physical clusters will be described for convenience. For example, the 0<sup>th</sup> physical cluster 10-0 may be composed of  $m+1$  recording units ranging from a 0<sup>th</sup> recording unit 10-0-0 to an  $m^{\text{th}}$  recording unit 10-0- $m$ .

According to the first embodiment, information on a drive and information on the state of the disc is recorded in a physical cluster. For example, information on a 0<sup>th</sup> drive is recorded in a 0<sup>th</sup> recording unit 10-0-0 of a 0<sup>th</sup> physical cluster 10-0 and information on a 0<sup>th</sup> state of the disc is recorded in a first recording unit 10-0-1 of the 0<sup>th</sup> physical cluster 10-0. Dummy data is recorded in remaining recording units of the 0<sup>th</sup> physical cluster. Thereafter, when a new drive records data on and/or reproduce data from the disc, information on the new drive, i.e., information on a first drive, is recorded in a 0<sup>th</sup> recording unit 10-1-0 of a first physical cluster 10-1 after the 0<sup>th</sup> physical cluster 10-0. Here, the information on the state of the disc is updated, i.e., information on a first state of the disc is recorded in a first recording unit 10-1-1 of the first physical cluster 10-1. Next, the information on the 0<sup>th</sup> drive and the information on the 0<sup>th</sup> state of the disc is copied from the 0<sup>th</sup> and first recording units of the 0<sup>th</sup> physical cluster into a second recording unit 10-1-2 and a third recording unit 10-1-3 of the first physical cluster 10-1, respectively.

When a new drive, i.e., a second drive, records data on the disc, information on the second drive and information on a second state of the disc is recorded in a second physical cluster 10-2 following a physical cluster in which data is lastly recorded, i.e., the first physical cluster 10-1. Here, the information on the second drive is recorded in a 0<sup>th</sup> recording unit 10-2-0 of the second physical cluster 10-2 and the information on the second state of the disc is recorded in a first recording unit 10-2-1 of the second physical cluster 10-2. Next, the information on the first drive, the information on the first state of the disc, the information on the 0<sup>th</sup> drive, and the information on the 0<sup>th</sup> state of the disc is copied into second, third, fourth, and fifth recording units 10-2-2, 10-2-3,

10-2-4, and 10-2-5 of the second physical cluster 10-2, respectively, following the 0<sup>th</sup> and first recording units 10-2-0 and 10-2-1.

As described above, every time information on a new drive and information on a new state of a disc is recorded in a physical cluster following a physical cluster in which information on a previous drive and information on a previous state of the disc is recorded, the information on the previous drive and the information on the previous state of the disc is also recorded in the physical cluster in which the information on the new drive and the information on the new state of the disc is recorded. This is to inform a new drive of information on a previous drive and the history of the state of the disc. Information on the new drive and information on a new state of the disc is recorded in starting sections of a physical cluster and the information on the previous drive and the information on the previous state of the disc is copied into sections of the physical cluster following the starting sections. Therefore, a user can obtain information on all used drives and information on all states of the disc by reproducing the physical cluster in which the information on the new drive and the information on the new state of the disc is recorded, without reproducing the physical cluster in which the information on the previous drive and the information on the previous states of the disc is recorded. As a result, the user can efficiently manage a new drive or efficiently check the state of a disc.

As previously described, the information on the state of the disc includes an address of a zone in which new OPC data is recorded, an address of a zone in which information on a last drive is recorded, a last recorded address of a zone of a user data area in which user data is lastly recorded, write protection information, and information for indicating whether additional user data is recordable in a user data area after recording user data. This will be explained in detail below.

Information on a recording and/or reproduction power necessary for recording and/or reproducing user data is recorded in the OPC test zone 10c whenever user data is recorded, and the recording and/or reproduction power can be adjusted to an optimum state using this information. New data corresponding to a power used whenever recording is performed is recorded as the information on the recording and/or reproduction power. In particular, in an event that a once-writable optical information storage medium is used, OPC data is recorded in a new zone in which data was not previously recorded whenever new data is recorded. When new data is recorded after

recording of data is completed, a zone in which new OPC data is to be recorded has to be found. Due to this, it is preferable that an address of the zone in which new OPC data is recorded is written to a predetermined zone so that a used drive can rapidly access it. In other words, the drive can quickly access a zone in which new OPC data is to be recorded when recording new OPC data by recording an address of a zone in which OPC data is lastly recorded in the drive & disc zone 10d and reproducing the address of the zone in which OPC data is lastly recorded without reproducing all zones in which OPC data is recorded.

As the information on the drive, information on the drive and information on the state of the disc is updated whenever a new drive records information on the disc. Thus, it is preferable that an address of a zone in which information on a lastly used drive and information on a last state of the disc is recorded as the information on the state of the disc. Thereafter, a position in which information on a new drive or information on a new state of the disc is to be recorded can be easily found when recording information on the new drive by reproducing the address of the zone in which information on the lastly used drive and the last state of the disc is recorded.

When recording of user data stops, and then new user data is recorded, a pickup has to find out and access a zone in which user data is to be recorded. Thus, it is preferable that an address of a zone in which user data is lastly recorded is recorded in the drive & disc zone 10d so that the pickup has a rapid access to the zone in which user data is to be recorded.

Instead of the address of the zone in which the information on the last drive and the information on the last state of the disc is recorded or the address of the zone in which user data is lastly recorded, an address of a zone in which information on a subsequent drive and information on a subsequent state of the disc will be recorded or an address of a zone in which subsequent user data will be recorded may be recorded in the drive & disc zone 10d.

If the information on the state of the disc containing information on a latest state of the disc is not supplied, all information recorded in the OPC test zone 10b, the drive & disc zone 10d, or the user data area has to be reproduced when recording user data. Thus, it takes a large amount of time for the drive to access the disc.

Information on the number of sessions necessary for determining how many sections the user data area is divided into may be recorded as the information on the

state of the disc. For example, the information on the number of sessions can be supplied in order to divide the user data area into several sections according to their use purpose or capacity so that the disc can be further conveniently used.

After recording of user data is completed, it is preferable that information  
5 necessary for determining whether additional user data is recordable is recorded immediately after the zone in which user data is lastly recorded. Data indicating that recording of additional user data is impossible after recording of user data is completed can be recorded so that additional user data is not recorded any more. However, if  
10 recording of additional user data is possible, data indicating that additional user data can be recorded right after the zone in which user data is lastly recorded is recorded.

The state address information contained in the information on the state of the disc will now be described.

The state address information includes at least one of state information containing information on a recording mode, the type of a file system, and a recording  
15 layer on which user data is recorded, a last recorded address of a zone in which user data is lastly recorded, and a last replaced address of an outer spare area in which data has been replaced to manage defects on the disc.

FIG. 11A through 11D are views for explaining the state address information contained in the information on the state of the disc. Referring to FIGS. 11A through  
20 11D, information on an  $n^{\text{th}}$  state of the disc or information on an  $n^{\text{th}}$  drive and an  $n^{\text{th}}$  state of the disc is recorded in a  $0^{\text{th}}$  recording unit 10-n-0 of an  $n^{\text{th}}$  physical cluster 10-n.

The state address information contains state information, a last recorded address of a zone in which user data is lastly recorded, and a last replaced address of an outer spare area in which data has been replaced to manage defects on the disc.

25 FIGS. 11A and 11B each illustrate state address information recorded on a single layer disc having one recording layer on which information on the state of the single layer disc is only recorded in one recording unit, and FIGS. 11C and 11D each illustrate state address information on a dual layer disc having two recording layers on which information on the state of the dual layer disc and information on a drive is recorded in  
30 one recording unit, together.

The state information contains information on a recording mode, the type of a file system, and a recording layer.

The information on the recording mode indicates whether data has been recorded in a continuous recording mode or a random recording mode on the disc.

The information on the type of the file system indicates what type of file system the information storage medium according to the present invention uses to record data in file type, such as recording data in a hard disc of a computer in file type.

The information on the recording layer indicates whether data has been recorded on a first recording layer (a recording layer 0) or a second recording layer (a recording layer 1). Only the recording layer 0 may exist in a single layer disc having one recording layer.

The last recorded address is an address of an ECC block in a user data area of each of recording layers in which data is recorded. If an address is assigned to each of sectors, the address of the ECC block corresponds to an address of a first sector thereof.

The last replaced address of the outer spare area is an address of a last ECC block of the outer spare area in which data is recorded in order to manage detects. If an address is assigned to each of the sectors, the address of the ECC block corresponds to an address of a first sector thereof.

FIGS. 12A and 12B each illustrate the last recorded address and the last replaced address. In FIG. 12A, user data is recorded in the continuous recording mode in the user data area, and in FIG. 12B, user data is recorded in the random recording mode in the user data area.

A section in which recording of user data is possible can be rapidly found during subsequent recording of user data by storing the last recorded address of the user data area in which user data is recorded and the last replaced address of the outer spare area in which data is recorded in order to manage the defects as the information on the state of the disc.

When data is recorded in the outer spare area assigned to manage the defects, the data is recorded starting from a zone having a great address value toward a zone having a small address value, unlike a method of recording user data in the user data area.

FIGS. 13A and 13B are views for explaining the outer spare area shown in FIGS. 12A and 12B.

FIG. 13A illustrates the outer spare area of the single layer disc and FIG. 13B illustrates the outer spare area of the dual layer disc. The outer spare area for managing the defects corresponds to an outer spare area 0 in the single layer disc shown in FIG. 13A and to an inner spare area 1 of a recording layer 1 in the dual layer disc shown in FIG. 13B.

When data is recorded in the outer spare area 0 of the single layer disc shown in FIG. 13A, the data is recorded starting from outer tracks of the signal layer disc toward inner tracks. When data is recorded in the inner spare area 1 of the recording layer 1 of the dual layer disc shown in FIG. 13B, the data is recorded starting from inner tracks of the dual layer disc toward outer tracks.

FIGS. 14A through 14D are views for explaining a format of the state address information.

FIGS. 14A and 14B each illustrate state address information formatted on the single layer disc and FIGS. 14C and 14C each illustrate state address information formatted on the dual layer disc. In FIGS. 14A and 14C, state information is recorded as 8 bits at the beginning of a physical cluster, and in FIGS. 14B and 14D, state information is divided into state information 1 and 2, each of which is recorded as 4 bits.

The information on the state of the disc can be recorded in the drive & disc zone 10d of the recordable zone 10 of the lead-in or lead-out area whenever recording of user data is finished. As a result, the pickup can accurately and rapidly access a corresponding zone using the information on the state of the disc when recording user data later. Also, user data can be efficiently recorded and/or reproduced. In particular, the information on the state of the disc is useful for a once-writable information storage medium.

As described above, according to the first embodiment, information on a drive and information on the state of a disc can be recorded together. Also, whenever this information is updated, the updated information can be recorded in a physical cluster or ECC block following a physical cluster or ECC block in which information on a previous drive and information on a previous state of the disc is recorded.

An information storage medium (a disc) and a method of recording information thereon according to a second embodiment of the present invention will be described.

Referring to FIG. 3, the drive & disc zone 10-d is composed of a plurality of physical clusters or ECC blocks 10-1, 10-2, ..., and 10-n, each of which is composed of

a plurality of recording units 10-0-0, 10-0-1, ..., and 10-0-m such as sectors or data frames. According to the second embodiment, information on a 0<sup>th</sup> drive and information on a 0<sup>th</sup> state of the disc is recorded in different physical clusters or ECC blocks. Thereafter, when a new drive records data on and/or reproduces data from the disc, information on the new drive and updated information on the state of the disc is also recorded in different physical clusters or ECC blocks. Preferably, the information on the new drive and the updated information on the state of the disc is recorded in physical cluster or ECC blocks following physical clusters or ECC blocks in which information on a previous drive and information on a previous state of the disc is recorded. Here, information on all used drives and information on all states of the disc is alternately recorded from a starting part of the drive & disc zone 10d. Hereinafter, only physical clusters will be described for convenience.

Information on the 0<sup>th</sup> drive is recorded in the 0<sup>th</sup> physical cluster 10-0 and information on the 0<sup>th</sup> state of the disc is recorded in the first physical cluster 10-1. Next, when another drive, i.e., a first drive, records data on and/or reproduces data from the disc, information on the first drive and information on a first state of the disc is recorded in the second physical cluster 10-2 and the third physical cluster 10-3, respectively. Here, it is preferable that information on a new drive and information on a new state of the disc is recorded in 0<sup>th</sup> recording units of corresponding physical clusters, respectively, and then information on previous drives and information on previous states of the disc is copied starting from first recording units. The reason why the information on the previous drives and the information on the previous states of the disc is copied is as previously explained.

When information on a drive and information on the state of a disc is recorded in different physical clusters as described above, it is preferable that at least one of an address of a zone in which information on a last drive is recorded and an address of a zone in which information on a last state of the disc is recorded is recorded as the information on the state of the disc.

An information storage medium (a disc) and a method of recording data thereon according to a third embodiment will be described with reference to FIG. 4A. The present embodiment is characterized in that information on a drive and information on the state of a disc is recorded in one of recording units constituting physical clusters or ECC blocks of the drive & disc zone 10d. In detail, information on a used drive, i.e., a



0<sup>th</sup> drive, and information on a 0<sup>th</sup> state of the disc is recorded in a 0<sup>th</sup> recording unit 10-0-0 of a 0<sup>th</sup> physical cluster 10-0. Thereafter, when another drive, i.e., a first drive, records data on and/or reproduces data from the disc, information on the first drive and information on a first state of the disc is recorded in a 0<sup>th</sup> recording unit 10-1-0 of a first physical cluster 10-1 right after the 0<sup>th</sup> physical cluster 10-0. The information on the 0<sup>th</sup> drive and the information on the 0<sup>th</sup> state of the disc is copied into a first recording unit 10-1-1 of the first physical cluster 10-1.

When a second drive records data on and/or reproduces data from the disc, information on the second drive and information on a second state of the disc is recorded in a 0<sup>th</sup> recording unit 10-2-0 of a second physical cluster 10-2. The information on the first drive and the first state of the disc and the 0<sup>th</sup> drive, and the information on the 0<sup>th</sup> drive and the 0<sup>th</sup> state of the disc is copied into first and second recording units 10-2-1 and 10-2-2, respectively.

As shown in FIG. 4B, in order to increase the reliability of recording/reproducing of information on a drive and information on the state of a disc, original information on the drive and original information on the state of the disc may be recorded in a predetermined physical cluster, and then copied into another physical cluster. For example, original information on a 0<sup>th</sup> drive and original information on a 0<sup>th</sup> state of the disc is recorded in a 0<sup>th</sup> recording unit 10-0-0 of a 0<sup>th</sup> physical cluster 10-0, and then copied into a 0<sup>th</sup> recording unit 10-1-0 of a first physical cluster 10-1.

When another drive, i.e., a first drive, records data and/or reproduces data from the disc, original information on the first drive and original information on a first state of the disc is recorded in a second physical cluster 10-2 right after the first physical cluster 10-1 into which the original information on the 0<sup>th</sup> drive and the original information on the 0<sup>th</sup> state of the disc is copied, and then copied into a third physical cluster 10-3. In the present embodiment, original information on a drive and original information on the state of a disc is first recorded and then copied. However, this may be applied to the first and second embodiments. Therefore, when original information on a drive and original information on the state of a disc is damaged or a defect appears, copied information on the drive and copied information on the state of the disc can be reproduced. As a result, an efficiency of recording and/or reproducing data can be improved.

Information on a drive and information on the state of a disc recorded in a recording unit according to the third embodiment is as shown in FIG. 5.

An information storage medium (a disc) and a method of recording data thereon according to a fourth embodiment of the present invention will be described with  
5 reference to FIGS. 6A and 6B. Referring to FIGS. 6A and 6B, a drive & disc zone 10d of a recordable zone 10 of a lead-in or lead-out area, except a user data area, is divided into two zones. Information on a drive is recorded in the fore zone and information on the state of a disc is recorded in the back zone. The drive & disc zone 10d shown in  
10 FIG. 6A is the same as that shown in FIG. 1 except that the drive & disc zone 10d is divided into two zones, and thus will not be explained herein.

As shown in FIG. 6B, the drive & disc zone 10d is, for example, composed of  $n+1$  physical clusters or ECC blocks. Information on the drive is recorded in the fore half of the drive & disc zone 10d and information on the state of the disc is recorded in the  
15 back half of the drive & disc zone 10d. In other words, whenever information on a new drive is recorded, the information is sequentially recorded starting from a  $0^{\text{th}}$  physical cluster 10-0 to a  $(n-1)/2^{\text{th}}$  physical cluster 10- $(n-1)/2$ . Whenever information on the state of the disc is updated, the updated information is sequentially recorded starting from a  $(n+1)/2^{\text{th}}$  physical cluster 10- $(n+1)/2$  to an  $n^{\text{th}}$  physical cluster 10- $n$ .

In more detail, information on a  $0^{\text{th}}$  drive is recorded in a  $0^{\text{th}}$  recording unit 10-0-0  
20 of a  $0^{\text{th}}$  physical cluster 10-0, and then information on a  $0^{\text{th}}$  state of the disc is recorded in a  $0^{\text{th}}$  recording unit 10- $(n+1)/2$  of a  $(n+1)/2^{\text{th}}$  physical cluster 10- $(n+1)/2$ . Next, when a new drive, i.e., a first drive, records data on and/or reproduces data from the disc, information on the first drive is recorded in a  $0^{\text{th}}$  recording unit 10-1-0 of a first physical cluster 10-1. Here, it is preferable that the information on the  $0^{\text{th}}$  drive is copied into a  
25 first recording unit 10-1-1 of the first physical cluster 10-1. Information on a first state of the disc is recorded in a  $0^{\text{th}}$  recording unit 10- $(n+3)/2$ -0 of a  $(n+3)/2^{\text{th}}$  physical cluster 10- $(n+3)/2$ , and then the information on the  $0^{\text{th}}$  state of the disc is copied into a first recording unit 10- $(n+3)/2$ -1 of the  $(n+3)/2^{\text{th}}$  physical cluster 10- $(n+3)/2$ .

In the above-described first through fourth embodiments, information on a drive  
30 is recorded prior to information on the state of a disc. However, the information on the state of the disc may be recorded prior to the information on the drive.

FIG. 7A is a view for explaining an example of a method of recording data on an information storage medium (a disc) according to a fifth embodiment of the present

invention. The drive & disc zone 10d may include  $n+1$  physical clusters or ECC blocks ranging from a  $0^{\text{th}}$  physical cluster or ECC block 10-0 to a  $n^{\text{th}}$  physical cluster or ECC block 10-n. The  $0^{\text{th}}$  physical cluster or ECC block 10-0 may be composed of  $m+1$  recording units ranging from a  $0^{\text{th}}$  recording unit 10-0-0 to an  $m^{\text{th}}$  recording unit.

- 5        The method of recording data on the information storage medium according to the fifth embodiment is characterized in that when information on a drive and information on the state of a disc is updated, information on a previous state of the disc is not recorded but only updated information on the state of the disc is only recorded. However, information on a new drive is recorded and information on a previous drive is
- 10       copied. Thus, when information on the drive and information on the state of the disc is updated, the updated information may be recorded in another positions.

- For example, as shown in FIG. 7A, information on the state of the disc may be recorded in a starting recording unit of a physical cluster or ECC block and information on the drive may be recorded in a recording unit right after the starting recording unit.
- 15       In detail, information on a  $0^{\text{th}}$  state of the disc is recorded in a  $0^{\text{th}}$  recording unit 10-0-0 of a  $0^{\text{th}}$  physical cluster 10-0 and information on a  $0^{\text{th}}$  drive is recorded in a first recording unit 10-0-1 of the  $0^{\text{th}}$  physical cluster 10-0. Dummy data is recorded in remaining recording units of the  $0^{\text{th}}$  physical cluster 10-0. When a new drive records data on and/or reproduces data from the disc, information on a new state of the disc, i.e.,
- 20       a first state of the disc, is recorded in a  $0^{\text{th}}$  recording unit 10-1-0 of a first physical cluster 10-1. Information on the new drive, i.e., a first drive, is recorded in a first recording unit 10-1-1 of the first physical cluster 10-1. The information on the  $0^{\text{th}}$  drive is copied into a second recording unit 10-1-2 of the first physical cluster 10-1.

- When information on a second state of the disc and information on a second
- 25       drive is recorded in a second physical cluster 10-2, the information in the second state of the disc is recorded in a  $0^{\text{th}}$  recording unit 10-2-0 of the second physical cluster 10-2 and the information on the first and  $0^{\text{th}}$  states of the disc is not recorded. The information on the second drive is recorded in a first recording unit 10-2-1 and the information on the first drive and the information on the  $0^{\text{th}}$  drive is copied into a second
- 30       recording unit 10-2-2 and a third recording unit 10-2-3, respectively.

In the fifth embodiment, only updated information on the state of a disc is recorded, but information on previous states of the disc is not recorded. As for

information on used drives, information on a new drive is recorded and information on previous drives is copied.

5 The information on the state of the disc, for example, may be at least one of an address of a zone in which new OPC data is recorded, an address of a zone in which information on a last drive or information on a last state of a disc is recorded, a last recorded address of a zone of a user data area in which user data is lastly recorded, write protection information, information on the number of sessions, information necessary for determining whether additional user data is recordable, an address of a zone in which information on a subsequent drive or information on a subsequent state  
10 of the disc is to be recorded, and an address of a zone in which subsequent user data is to be recorded. If one of these addresses is changed into a new one, information on the previous address is unnecessary. Thus, it is preferable that only updated information on the state of the disc is recorded.

15 In an event that information on a new drive contains pieces of information similar or equal to pieces of information on a previous drive, the new drive can be easily set up using the pieces of information on the previous drive. Therefore, since the information on the previous drive may be used, it is preferable that information on a new drive is recorded along with information on a previous drive.

20 As shown in FIG. 7B, in order to increase the reliability of information on the state of a disc and information on a drive, the information on the state of the disc and the information on the drive can be copied from a physical cluster to another. For example, information on a 0<sup>th</sup> state of the disc and information on a 0<sup>th</sup> drive is recorded in a 0<sup>th</sup> physical cluster 10-0, and then copied into a first physical cluster 10-1. Information on a first state of the disc is recorded in a 0<sup>th</sup> recording unit 10-2-0 of a second physical  
25 cluster 10-2, information on a first drive is recorded in a first recording unit 10-2-1 of the second physical cluster 10-2, and the information on the 0<sup>th</sup> drive is copied into a second recording unit 10-2-2 of the second physical cluster 10-2, and then copied into a third physical cluster 10-3.

30 Another example of the fifth embodiment will be described with reference to FIG. 8A.

Information on a new drive is recorded in a starting recording unit of a predetermined physical cluster and information on a previous drive is copied into a

recording unit right after the starting recording unit. Next, information on a new state of a disc is recorded in a last recording unit of the predetermined physical section.

In detail, information on a 0<sup>th</sup> drive is recorded in a 0<sup>th</sup> recording unit 10-0-0 of a 0<sup>th</sup> physical cluster 10-0 and information on a 0<sup>th</sup> state of the disc is recorded in an m<sup>th</sup> recording unit 10-0-m of the 0<sup>th</sup> physical cluster. Information on a first drive is recorded in a 0<sup>th</sup> recording unit 10-1-0 of a first physical cluster 10-1 and the information on the 0<sup>th</sup> drive is copied into a first recording unit 10-1-1 of the first physical cluster 10-1. Information on a first state of the disc is recorded in an m<sup>th</sup> recording unit 10-1-m of the first physical cluster 10-1. Every time information on the drive and information on the state of the disc is updated, recording is performed according to this method.

This method has an advantage in that a position in which information on the state of the disc is updated is determined as a last recording section.

As shown in FIG. 8B, in order to increase the reliability of information on the state of a disc and information on a drive, the information on the state of the disc and the information on the drive can be copied from a physical cluster to another.

Another example of the fifth embodiment will be explained with reference to FIG. 9. In this example, information on a drive is first recorded, and then updated information on the state of a disc is recorded in a recording unit right after a recording unit in which information on the drive is lastly recorded.

For example, information on a 0<sup>th</sup> drive is recorded in a 0<sup>th</sup> recording unit 10-0-0 of a 0<sup>th</sup> physical cluster 10-0 and information on a 0<sup>th</sup> state of the disc is recorded in a first recording unit 10-0-1 of the 0<sup>th</sup> physical cluster 10-0. Information on a first drive is recorded in a 0<sup>th</sup> recording unit 10-1-0 of a first physical cluster 10-1 and the information on the 0<sup>th</sup> drive is copied into a first recording unit 10-1-1 of the first physical cluster 10-1. Next, information on a first state of the disc is recorded in a second recording unit 10-1-2 of the first physical cluster 10-1.

In other words, in this example, information on a new drive is recorded in a starting recording unit of a predetermined physical cluster, information on a previous drive is copied into a recording unit right after the starting recording unit, and information on a new state of a disc is recorded in a recording unit right after the recording unit into which the information on the previous drive is copied.

According to the example described with reference to FIG. 9, when information on a new drive and information on a new state of a disc is recorded, information on a

previous drive and information on a previous state of the disc can be copied into a physical cluster following a physical cluster in which the information on the previous drive and the information on the previous state of the disc is recorded, in order to increase the reliability of information.

- 5        The recording units may be sectors or data frames, and in particular, updated information on the state of the disc may be regarded as being recorded in one recording unit.

10        An information storage medium (a disc) and a method of recording data thereon according to a sixth embodiment of the present invention will be described with reference to FIG. 10A.

In the sixth embodiment, information on the state of a disc is recorded whenever being updated, and information on a drive is selectively recorded according to the standards of a used drive.

15        For example, 0<sup>th</sup> and first drives are standardized so as not to record information about themselves, and second and third drives are standardized as recording information about themselves. Thus, when the 0<sup>th</sup> drive records information on and/or reproduce information from a disc, information on a 0<sup>th</sup> state of the disc is recorded in a 0<sup>th</sup> recording unit 10-0-0 of a 0<sup>th</sup> physical cluster 10-0 and information on the 0<sup>th</sup> drive is not recorded. When the first drive records information on and/or  
20        reproduces from the disc, information on a first state of the disc is recorded in a 0<sup>th</sup> recording unit 10-1-0 of a first physical cluster 10-1 and information on the first drive is not recorded.

25        When the second drive records information on and/or reproduces information from the disc, information on a second state of the disc is recorded in a 0<sup>th</sup> recording unit 10-2-0 of a second physical cluster 10-2 and the information on the 0<sup>th</sup> drive is recorded in a first recording unit 10-2-1 of the second physical cluster 10-2. Next, when the third drive records information on and/or reproduces from the disc, information on a third state of the disc is recorded in a 0<sup>th</sup> recording unit 10-3-0 of a third physical cluster 10-3. Thereafter, the information on the first drive is recorded in a first  
30        recording unit 10-3-1 of the third physical cluster 10-3, and the information on the 0<sup>th</sup> drive is copied into a second recording unit 10-3-2 of the third physical cluster 10-3.

As described above, in the method of recording information on the disc according to the sixth embodiment, recording of updated information on the state of the disc is

mandatory and recording of information on a new drive is optional according to its standards. Also, if a used drive is standardized as not to record information about itself, the information on the used drive is not recorded, but previously recorded information on a previous drive is copied.

- 5        Another example of the sixth embodiment will be explained with reference to FIG. 10B. Here, a 0<sup>th</sup> drive is standardized so as not to record information about itself, first and second drives are standardized so as to record information about themselves, and a third drive is standardized so as not to record information about itself.

- 10        Therefore, according to the above example, when the 0<sup>th</sup> drive records information on and/or reproduces information from a disc, information on a 0<sup>th</sup> state of the disc is recorded in a 0<sup>th</sup> recording unit 10-0-0 of a 0<sup>th</sup> physical cluster 10-0 and information on the 0<sup>th</sup> drive is not recorded. Next, when the first drive records information on and/or reproduces information from the disc, information on a first state of the disc is recorded in a 0<sup>th</sup> recording unit 10-1-0 of a first physical cluster 10-1 and
- 15        the information on the 0<sup>th</sup> drive is recorded in a first recording unit 10-1-1 of the first physical cluster 10-1. When the second drive records information on and/or reproduces information from the disc, information on a second state of the disc is recorded in a 0<sup>th</sup> recording unit 10-2-0 of a second physical cluster 10-2 and information on the first drive is recorded in a first recording unit 10-2-1 of the second physical
- 20        cluster 10-2. The information on the 0<sup>th</sup> drive is copied into a second recording unit 10-2-2 of the second physical cluster 10-2.

- When the third drive records information on and/or reproduces information from the disc, information on a third state of the disc is recorded in a 0<sup>th</sup> recording unit 10-3-0 of a third physical cluster 10-3 and information on the third drive is not recorded. The
- 25        information on the first drive and the information on the 0<sup>th</sup> drive is copied into a first recording unit 10-3-1 and a second recording unit 10-3-2 of the third physical cluster 10-3, respectively.

- In the above-described example, updated information on the state of a disc is recorded in a 0<sup>th</sup> recording unit of a predetermined physical cluster and information on a
- 30        drive is recorded in a recording unit following the 0<sup>th</sup> recording unit. Alternatively, the updated information on the state of the disc may be recorded in a last recording unit of the predetermined physical cluster. For example, let us assume that 0<sup>th</sup> and first drives are standardized so as not to record information about themselves, and second and

third drives are standardized so as to record information about themselves. In this case, as shown in FIG. 10C, information on a 0<sup>th</sup> state of the disc is recorded in an m<sup>th</sup> recording unit 10-0-m of a 0<sup>th</sup> physical cluster 10-0, and information on a first state of the disc is recorded in an m<sup>th</sup> recording unit 10-1-m of a first physical cluster 10-1.

5 Here, information on used drives is not recorded.

Information on a 0<sup>th</sup> drive is recorded in a 0<sup>th</sup> recording unit 10-2-0 of a second physical cluster 10-2 and information on a second state of the disc is recorded in an m<sup>th</sup> recording unit 10-2-m of the second physical cluster 10-2. Information on a first drive is recorded in a 0<sup>th</sup> recording unit 10-3-0 of a third physical cluster 10-3, the information  
10 on the 0<sup>th</sup> drive is copied into a first recording unit 10-3-1 of the third physical cluster 10-3, and information on a third state of the disc is recorded in an m<sup>th</sup> recording unit 10-3-m of the third physical cluster 10-3.

As described above, recording of updated information on the state of a disc in a last recording unit of each of physical clusters is mandatory and recording of information  
15 on used drives in a starting recording unit of each of the physical clusters is optional according to its standards. Also, information on previous drives can be copied.

The reliability of information can be secured by copying information on a previous state of a disc and information on a previous drive into a next physical cluster using the method according to the sixth embodiment.

20 In summary, in a method of recording information on an information storage medium (a disc) according to the present invention, information on drives and information on states of a disc is recorded in a drive & disc zone 10d of a recordable zone of a lead-in or lead-out area except a user data area. The drive & disc zone 10d is composed of a plurality of physical clusters or ECC blocks. Also, whenever  
25 information on a new drive and information on a new state of the disc is recorded, the information on the new drive and the information on the new state of the disc is recorded in a physical cluster or ECC block different from a physical cluster or ECC block in which information on a previous drive and information on a previous state of the disc is recorded.

30 Information on a used drive and information on the state of a disc may be recorded in a physical cluster or ECC block or different physical clusters or ECC blocks. In addition, each of the plurality of physical clusters or ECC blocks is composed of a plurality of recording units such as sectors or data frames. In a case where information



on a used drive and information on the state of a disc is recorded in a physical cluster, the information on the used drive and the information on the state of the disc may be recorded in different recording units of the physical cluster as described with reference to FIG. 2 or in a recording unit of the physical cluster as described with reference to FIG.

5 4A.

In an event that information on used drives and information on the states of a disc is recorded in different physical clusters or ECC blocks, as described with reference to FIG. 3, the information on the used drives and the information on the states of the disc can be alternately recorded starting from a beginning physical cluster or ECC  
10 block of the drive & disc zone 10d. Alternatively, as described with reference to FIG. 6B, after the drive & disc zone 10d may be divided into two zones, at least one of information on the used drives and information on the states of the disc may be sequentially recorded in physical clusters or ECC blocks of the fore zone and remaining information may be sequentially recorded in physical clusters or ECC blocks of the  
15 remaining zone. In other words, at least one of information on a new drive and information on a new state of the disc is recorded in the fore one of the two divided zones, and remaining information is recorded in the remaining zone. As described above, information on used drives and information on states of a disc can be recorded using various methods.

20 When information on a new drive is recorded and information on the state of a disc is updated, only the updated information may be recorded and information on a previous state of the disc may not be recorded. The information on the new drive is recorded together with information on a previous drive.

As shown in FIG. 7A, updated information on the state of a disc may be recorded  
25 in a 0<sup>th</sup> recording unit of a new physical cluster and information on a new drive may be recorded in a first recording unit of the new physical cluster. Also, information on previous drives may be sequentially copied starting from a second recording unit. As a result, a drive & disc zone can be efficiently used by recording only updated information on the state of the disc.

30 As shown in FIG. 8A, updated information on a drive may be recorded in a 0<sup>th</sup> recording unit of a predetermined physical cluster, and then information on a previous drive may be copied. Updated information on the state of a disc may be recorded in a last recording unit of the predetermined physical cluster. As shown in FIG. 9,

information on a new drive and information on a previous drive may be recorded, and then updated information on a disc may be recorded in a recording unit right after a recording unit in which information on a drive is lastly recorded.

5 [Effect of the Invention]

As described above, in an information storage medium (a disc) and a method of recording information thereon according to the present invention, zones in which information on drives and information on states of a disc can be efficiently used. Also, the information on the drives and the information on the states of the disc can be used  
10 in a new format.

In addition, the information storage medium and the method of recording information thereon according to the present invention can be applied to once-writable information storage media as well as several-time-rewritable information storage media. In particular, when information on a drive and information on the state of a disc is  
15 recorded on a once-writable information storage medium, the information on the drive and the information on the state of the disc can be recorded only one time in a physical cluster or ECC block. Thus, when information on a new drive and information on a new state of the disc is recorded, the physical cluster or ECC block in which the information on the drive and the information on the state of the disc cannot be used.  
20 Instead, the information on the new drive and the information on the new state of the disc should be recorded in a physical cluster or ECC block right after a physical cluster or ECC block in which information on a last drive and information on a last state of the disc is recorded. Therefore, it is preferable that the method of recording information according to the present invention is applied to once-writable information storage  
25 medium.

Moreover, in a case of a several-time-rewritable information storage medium, information on previous drives and information on previous states of the disc is recorded in a zone in which information on a last drive and information on a last state of the disc is recorded. Thus, a drive & disc zone can be efficiently managed by reproducing only  
30 the zone in which the information on the last drive and the information on the last state of the disc is recorded.

Furthermore, whenever recording of user data is completed, information on a latest state of a disc is recorded. Thus, a pickup can rapidly access an exact position

in which user data is to be recorded next time. As a result, since user data can be recorded using the information on the latest state of the disc, recording/reproduction efficiency can be improved.

- 5 While the present invention has been particularly shown and described with reference to exemplary embodiments thereof, it will be understood by those of ordinary skill in the art that various changes in form and details may be made therein without departing from the spirit and scope of the present invention as defined by the following claims.

What is claimed is:

1. An information storage medium (a disc) comprising an area and a user data area, the area including a recordable zone having a drive & disc zone in which information on a drive and information on a state of the disc is recorded, wherein the drive & disc zone includes a plurality of physical clusters or ECC blocks and the information on the drive and the information on the state of the disc is recorded in a physical cluster or ECC block.
2. The information storage medium of claim 1, wherein whenever the information on the drive and the information on the state of the disc is updated, the updated information is recorded in a physical cluster or ECC block different from a physical cluster or ECC block in which information on a previous drive and information on a previous state of the disc is recorded.
3. The information storage medium of claim 2, wherein whenever the information on the drive and the information on the state of the disc is updated, the updated information is recorded in a physical cluster or ECC block right after a physical cluster or ECC block in which information on a previous drive and information on a previous state of the disc is recorded.
4. The information storage medium of claim 2, wherein each of the plurality of physical clusters or ECC blocks comprises a plurality of recording units, and the information on the drive and the information on the state of the disc is sequentially recorded in different recording units of a physical cluster or an ECC block.
5. The information storage medium of claim 2, wherein each of the plurality of physical clusters or ECC blocks comprises a plurality of recording units, and the information on the drive and the information on the state of the disc is recorded in the same recording unit of a physical cluster.
6. The information storage medium of claim 4 or 5, wherein the plurality of recording units are sectors or data frames.

7. The information storage medium of claim 4 or 5, wherein the information on the drive and the information on the state of the disc is copied into a physical cluster or ECC block following a physical cluster or ECC block in which the information on the drive and the information on the state of the disc is recorded.

5

8. The information storage medium of claim 4 or 5, wherein information on a new drive and information on a latest state of the disc is recorded in a starting recording unit of the physical cluster or ECC block, and then the information on the drive and the information on the state of the disc is copied into a recording unit right after the starting recording unit.

10

9. The information storage medium of any one of claims 1 through 5, wherein the information on the state of the disc comprises at least one of an address of a zone in which new OPC data is recorded, an address of a zone in which information on a last drive and information on a latest state of the disc is recorded, a last recorded address of a zone in which user data is lastly recorded, information on the number of sessions, write protection information, and information for indicating whether additional user data is recordable after recording user data.

15

10. The information storage medium of any one of claims 1 through 5, wherein the information on the state of the disc comprises at least one of information on a recording mode, information on the type of a file system, information on a recording layer on which user data is recorded, a last recorded address of a zone which user data is lastly recorded, and a last replaced address of a spare area in which data is replaced to manage defects.

20

25

11. The information storage medium of any one of claims 1 through 5, wherein the information on the state of the disc comprises information necessary for indicating an address of a zone in which information on a subsequent drive and information on a subsequent state of the disc is to be recorded or information necessary for indicating an address of a zone in which user data is to be recorded.

30

12. The information storage medium of any one of claims 1 through 5, wherein the area is at least one of a lead-in area and a lead-out area.

13. An information storage medium (a disc) comprising an area and a user  
5 data area, the area including a recordable zone having a drive & disc zone in which information on a drive and information on a state of the disc is recorded, wherein the drive & disc zone includes a plurality of physical clusters or ECC blocks and the information on the drive and the information on the state of the disc is recorded in different physical clusters or ECC blocks.

10

14. The information storage medium of claim 13, wherein whenever the information on the drive and the information on the state of the disc is updated, the updated information is recorded in a physical cluster or ECC block different from a physical cluster or ECC block in which information on a previous drive and information  
15 on a previous state of the disc is recorded.

15. The information storage medium of claim 14, wherein whenever the information on the drive and the information on the state of the disc is updated, the updated information is recorded in a physical cluster or ECC block right after a physical  
20 cluster or ECC block in which information on a previous drive and information on a previous state of the disc is recorded.

16. The information storage medium of claim 14, wherein the information on the drive and the information on the state of the disc are sequentially and alternately  
25 recorded starting from a beginning part of the drive & disc zone.

17. The information storage medium of claim 14, wherein the drive & disc zone is divided into two zones, and one of the information on the drive and the information on the state of the disc is recorded in a first zone of two zones and the  
30 remaining information is recorded in a second zone of two zones.

18. The information storage medium of any one of claims 13 through 17, wherein the information on the drive and the information on the state of the disc is

copied into a physical cluster or ECC block following a physical cluster or ECC block in which the information on the drive and the information on the state of the disc is recorded.

19. The information storage medium of any one of claims 13 through 17,  
5 wherein information on a new drive and information on a latest state of the disc is recorded in a starting recording unit of the physical cluster or ECC block, and then the information on the drive and the information on the state of the disc is copied into a recording unit right after the starting recording unit.

10 20. The information storage medium of any one of claims 13 through 17, wherein the information on the state of the disc comprises at least one of an address of a zone in which new OPC data is recorded, an address of a zone in which information on a last drive and information on a latest state of the disc is recorded, a last recorded address of a zone in which user data is lastly recorded, information on the number of  
15 sessions, write protection information, and information for indicating whether additional user data is recordable after recording user data.

21. The information storage medium of any one of claims 13 through 17,  
wherein the information on the state of the disc comprises at least one of information on  
20 a recording mode, information on the type of a file system, information on a recording layer on which user data is recorded, a last recorded address of a zone which user data is lastly recorded, and a last replaced address of a spare area in which data is replaced to manage defects.

22. The information storage medium of any one of claims 13 through 17,  
25 wherein the information on the state of the disc comprises information necessary for indicating an address of a zone in which information on a subsequent drive and information on a subsequent state of the disc is to be recorded or information necessary for indicating an address of a zone in which user data is to be recorded.

30 23. The information storage medium of any one of claims 13 through 17, wherein the area is at least one of a lead-in area and a lead-out area.

24. A method of recording information on an information storage medium (a disc), the method comprising:

recording information on a drive and information on a state of the disc in one of a plurality of physical clusters or ECC blocks of a drive & disc zone of a recordable zone

5 included in an area except a user data area; and

recording information on a new drive and information on a latest state of the disc in a physical cluster or an ECC block different from a physical cluster or an ECC block in which the information on the drive and the information on the state of the disc is recorded whenever the information on the drive and the information on the state of the

10 disc is updated.

25. The method of claim 24, wherein whenever the information on the drive and the information on the state of the disc is updated, the updated information is recorded in a physical cluster or ECC block right after a physical cluster or ECC block in

15 which information on a previous drive and information on a previous state of the disc is recorded.

26. The method of claim 25, wherein each of the plurality of physical clusters or ECC blocks comprises a plurality of recording units, and the information on the drive and the information on the state of the disc is sequentially recorded in different

20 recording units of a physical cluster or an ECC block.

27. The method of claim 25, wherein each of the plurality of physical clusters or ECC blocks comprises a plurality of recording units, and the information on the drive and the information on the state of the disc is recorded in the same recording unit of a

25 physical cluster.

28. The method of claim 26 or 27, wherein the plurality of recording units are sectors or data frames.

29. The method of claim 26 or 27, wherein the information on the drive and the information on the state of the disc is copied into a physical cluster or ECC block



following a physical cluster or ECC block in which the information on the drive and the information on the state of the disc is recorded.

30. The method of claim 26 or 27, wherein information on a new drive and  
5 information on a latest state of the disc is recorded in a starting recording unit of the physical cluster or ECC block, and then the information on the drive and the information on the state of the disc is copied into a recording unit right after the starting recording unit.

10 31. The method of any one of claims 24 through 27, wherein the information on the state of the disc comprises at least one of an address of a zone in which new OPC data is recorded, an address of a zone in which information on a last drive and information on a latest state of the disc is recorded, a last recorded address of a zone in  
15 which user data is lastly recorded, information on the number of sessions, write protection information, and information for indicating whether additional user data is recordable after recording user data.

20 32. The method of any one of claims 24 through 27, wherein the information on the state of the disc comprises at least one of information on a recording mode, information on the type of a file system, information on a recording layer on which user data is recorded, a last recorded address of a zone which user data is lastly recorded, and a last replaced address of a spare area in which data is replaced to manage defects.

25 33. The method of any one of claims 24 through 27, wherein the information on the state of the disc comprises information necessary for indicating an address of a zone in which information on a subsequent drive and information on a subsequent state of the disc is to be recorded or information necessary for indicating an address of a  
30 zone in which user data is to be recorded.

34. The method of any one of claims 24 through 27, wherein the area is at least one of a lead-in area and a lead-out area.

35. A method of recording information on an information storage medium (a disc), the method comprising:

5 recording information on a drive and information on a state of the disc in different physical clusters or ECC blocks of a plurality of physical clusters or ECC blocks of a drive & disc zone of a recordable zone included in an area except a user data area; and  
recording information on a new drive and information on a latest state of the disc in a physical cluster or ECC block different from a physical cluster or ECC block in which the information on the drive and the information on the state of the disc is recorded whenever the information on the drive and the information on the state of the  
10 disc is updated.

36. The method of claim 35, wherein whenever the information on the drive and the information on the state of the disc is updated, the updated information is recorded in a physical cluster or ECC block right after a physical cluster or ECC block in  
15 which information on a previous drive and information on a previous state of the disc is recorded.

37. The method of claim 36, wherein the information on the drive and the information on the state of the disc are sequentially and alternately recorded starting  
20 from a beginning part of the drive & disc zone.

38. The method of claim 36, wherein the drive & disc zone is divided into two zones, and one of the information on the drive and the information on the state of the disc is recorded in a first zone of two zones and the remaining information is recorded in  
25 a second zone of two zones.

39. The method of any one of claims 35 through 38, wherein the information on the drive and the information on the state of the disc is copied into a physical cluster or ECC block following a physical cluster or ECC block in which the information on the  
30 drive and the information on the state of the disc is recorded.

40. The method of any one of claims 35 through 38, wherein information on a new drive and information on a latest state of the disc is recorded in a starting recording

unit of the physical cluster or ECC block, and then the information on the drive and the information on the state of the disc is copied into a recording unit right after the starting recording unit.

5           41. The method of any one of claims 35 through 38, wherein the information on the state of the disc comprises at least one of an address of a zone in which new OPC data is recorded, an address of a zone in which information on a last drive and information on a latest state of the disc is recorded, a last recorded address of a zone in which user data is lastly recorded, information on the number of sessions, write  
10 protection information, and information for indicating whether additional user data is recordable after recording user data.

          42. The method of any one of claims 35 through 38, wherein the information on the state of the disc comprises at least one of information on a recording mode,  
15 information on the type of a file system, information on a recording layer on which user data is recorded, a last recorded address of a zone which user data is lastly recorded, and a last replaced address of a spare area in which data is replaced to manage defects.

20           43. The method of any one of claims 35 through 38, wherein the information on the state of the disc comprises information necessary for indicating an address of a zone in which information on a subsequent drive and information on a subsequent state of the disc is to be recorded or information necessary for indicating an address of a zone in which user data is to be recorded.

25           44. An information storage medium (a disc) comprising an area and a user data area, the area including a recordable zone having a drive & disc zone in which information on a drive and information on the state of the disc is recorded, wherein the drive & disc zone includes a plurality of physical clusters or ECC blocks, and information  
30 on a new drive and updated information on the state of the disc is recorded in a physical cluster or an ECC block following a physical cluster or an ECC block in which the information on the drive and the information on the state of the disc is recorded and the

information on the drive is copied into the physical cluster or ECC block containing the information on the new drive and the updated information on the state of the disc.

5        45.    An information storage medium (a disc) comprising an area and a user data area, the area including a recordable zone having a drive & disc zone composed of a plurality of physical clusters or ECC blocks, wherein updated information on a state of the disc is recorded in a physical cluster or ECC block different from a physical cluster or an ECC block in which information on a previous state of the disc is recorded, and updated information on a drive is selectively recorded in the physical cluster or the ECC  
10    block in which the updated information on the state of the disc is recorded.

15        46.    The information storage medium of claim 45, wherein information on previous drives is copied into the physical cluster or the ECC block in which the updated information on the state of the disc is recorded.

20        47.    The information storage medium of any one of claims 44 through 46, wherein the updated information on the state of the disc is recorded in a 0<sup>th</sup> recording unit of a predetermined physical cluster or ECC block, the updated information on the drive is recorded in a first recording unit right after the 0<sup>th</sup> recording unit, and the  
25    information on the previous drives is sequentially copied into recording units after the first recording unit.

30        48.    The information storage medium of any one of claims 44 through 46, wherein the updated information on the drive is recorded in a 0<sup>th</sup> recording unit of a predetermined physical cluster or an ECC block, the information on previous drives is sequentially copied into recording units after the 0<sup>th</sup> recording unit, and the updated information on the state of the disc is recorded in a recording unit right after a last one of the recording units into which the information on the previous drives is copied.

35        49.    The information storage medium of any one of claims 44 through 46, wherein the updated information on the drive is recorded in a 0<sup>th</sup> recording unit of a predetermined physical cluster or an ECC block, the information on previous drives is sequentially copied into recording units after the 0<sup>th</sup> recording unit, and the updated

information on the state of the disc is recorded in a recording unit right after a last one of the recording units into which the information on the previous drives is copied.

5           50.    The information storage medium of claim 46, wherein when the updated information on the state of the disc is recorded in a starting recording unit of a predetermined physical cluster or ECC block and the updated information on the drive is not recorded, information on a previous drive is copied into a recording unit following the starting recording unit.

10           51.    The information storage medium of claim 46, wherein when the updated information on the state of the disc is recorded in a last recording unit of a predetermined physical cluster or ECC block and the updated information on the drive is not recorded, the information on the previous drives is sequentially copied starting from a beginning recording unit of the predetermined physical cluster or ECC block.

15           52.    The information storage medium of any one of claims 44 through 46, wherein the updated information on the state of the disc is recorded in one of recording units constituting each of the plurality of physical clusters or ECC blocks.

20           53.    The information storage medium of any one of claims 44 through 46, wherein the information on the drive and the information on the state of the disc is copied into a physical cluster or an ECC block following a physical cluster or an ECC block in which the information on the drive and the information on the state of the disc is recorded.

25           54.    The information storage medium of any one of claims 44 through 46, wherein the drive & disc zone is included in at least one of a lead-in area and a lead-out area.

30           55.    A method of recording information on an information storage medium (a disc), the method comprising:

recording information on a state of the disc and information on a drive in one of a plurality of physical clusters or ECC blocks of a drive & disc zone of a recordable zone included an area except a user data area;

5 recording updated information on the state of the disc and updated information on the drive in a physical cluster or an ECC block following the physical cluster or the ECC block in which the information on the state of the disc and the information on the drive is recorded; and

copying the information on the drive after recording the updated information on the drive.

10

56. A method of recording information on an information storage medium (a disc), the method comprising:

15 whenever information on a state of the disc is updated, recording the updated information on the state of the disc in different physical clusters or ECC blocks of a plurality of physical clusters or ECC blocks of a drive & disc zone of a recordable zone included an area except a user data area; and

selectively recording updated information on a drive in a physical cluster or an ECC block in which information on the state of the disc is recorded.

20

57. The method of claim 56, further comprising copying information on a previous drive into the physical cluster or ECC block in which the information on the state of the disc is recorded.

25

58. The method of any one of claims 55 through 57, wherein the updated information on the state of the disc is recorded in a 0<sup>th</sup> recording unit of a predetermined physical cluster or ECC block, the updated information on the drive is recorded in a first recording unit right after the 0<sup>th</sup> recording unit, and the information on the previous drives is sequentially copied into recording units after the first recording unit.

30

59. The method of any one of claims 55 through 57, wherein the updated information on the drive is recorded in a 0<sup>th</sup> recording unit of a predetermined physical cluster or an ECC block, the information on previous drives is sequentially copied into recording units after the 0<sup>th</sup> recording unit, and the updated information on the state of

the disc is recorded in a recording unit right after a last one of the recording units into which the information on the previous drives is copied.

5        60.    The method of any one of claims 51 through 57, wherein the updated information on the drive is recorded in a 0<sup>th</sup> recording unit of a predetermined physical cluster or an ECC block, the information on previous drives is sequentially copied into recording units after the 0<sup>th</sup> recording unit, and the updated information on the state of the disc is recorded in a recording unit right after a last one of the recording units into which the information on the previous drives is copied.

10

      61.    The method of claim 57, wherein when the updated information on the state of the disc is recorded in a starting recording unit of a predetermined physical cluster or ECC block and the updated information on the drive is not recorded, information on a previous drive is copied into a recording unit following the starting  
15        recording unit.

      62.    The method of claim 57, wherein when the updated information on the state of the disc is recorded in a last recording unit of a predetermined physical cluster or ECC block and the updated information on the drive is not recorded, the information  
20        on the previous drives is sequentially copied starting from a beginning recording unit of the predetermined physical cluster or ECC block.

      63.    The method of any one of claims 55 through 57, wherein the updated information on the state of the disc is recorded in one of recording units constituting  
25        each of the plurality of physical clusters or ECC blocks.

      64.    The method of any one of claims 55 through 57, wherein the information on the drive and the information on the state of the disc is copied into a physical cluster or an ECC block following a physical cluster or an ECC block in which the information  
30        on the drive and the information on the state of the disc is recorded.

      65.    The method of any one of claims 55 through 57, wherein the drive & disc zone is included in at least one of a lead-in area and a lead-out area.

FIG. 1

LEAD-IN AREA	DESCRIPTION	USE PURPOSE
READ-ONLY ZONE (5)	PITS OR HIGH FREQUENCY WOBBLES	DISC-RELATED CONTROL DATA
RECORDABLE ZONE (10)	DMA (10a)	DEFECT MANAGEMENT
	CONTROL DATA ZONE (10b)	DATA INFORMATION (CONTROL DATA)
	OPC TEST ZONE (10c)	OPC TESTING (OPC DATA)
	DRIVE & DISC ZONE (10d)	INFORMATION ON DRIVE AND INFORMATION ON THE STATE OF DISC
	BUFFER ZONE (10e)	BUFFER FOR USER DATA AREA



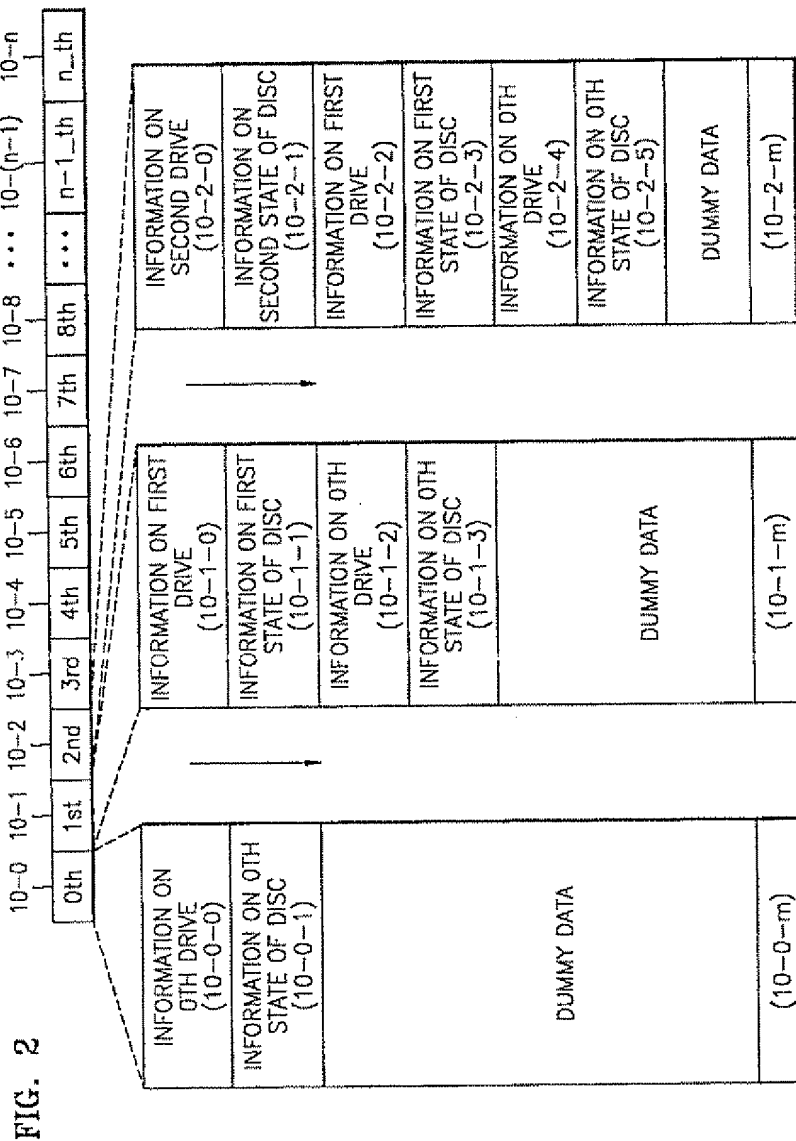
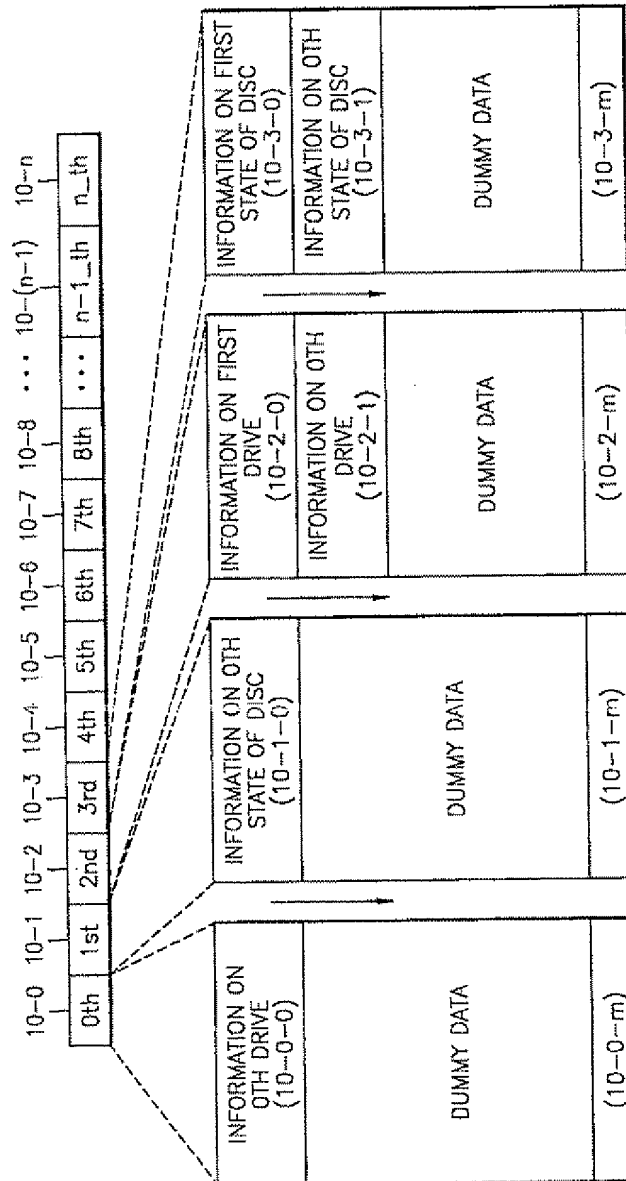


FIG. 3



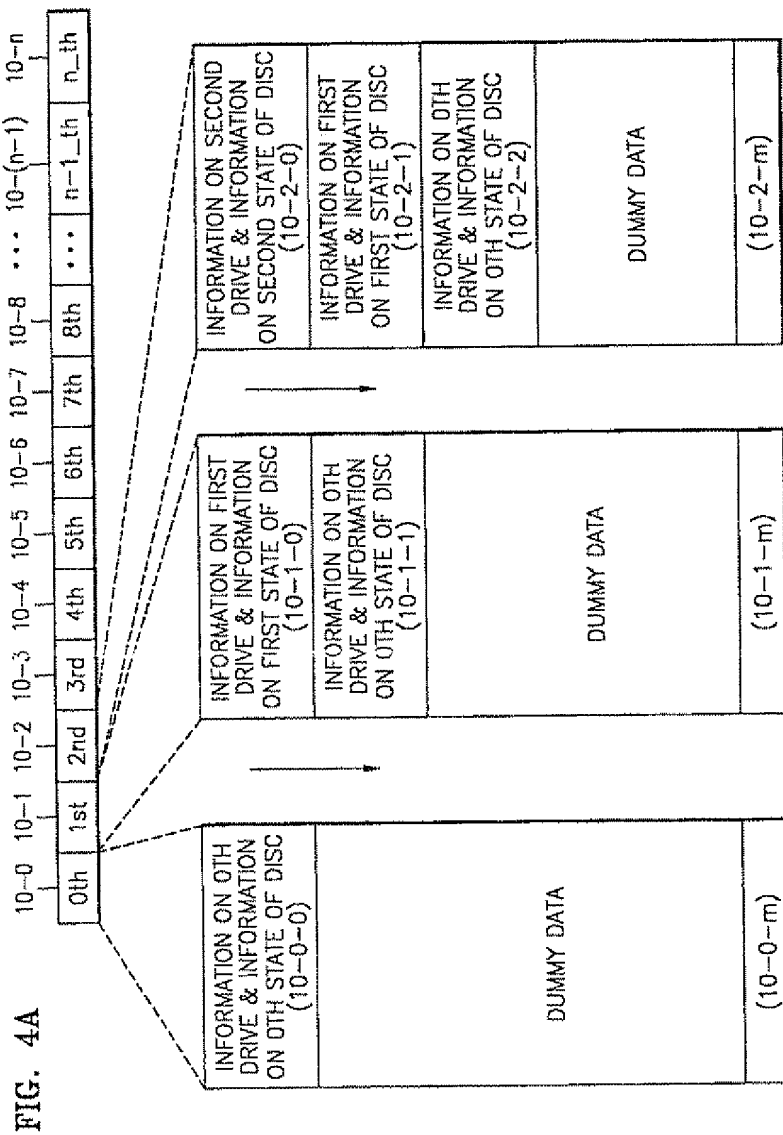


FIG. 4B

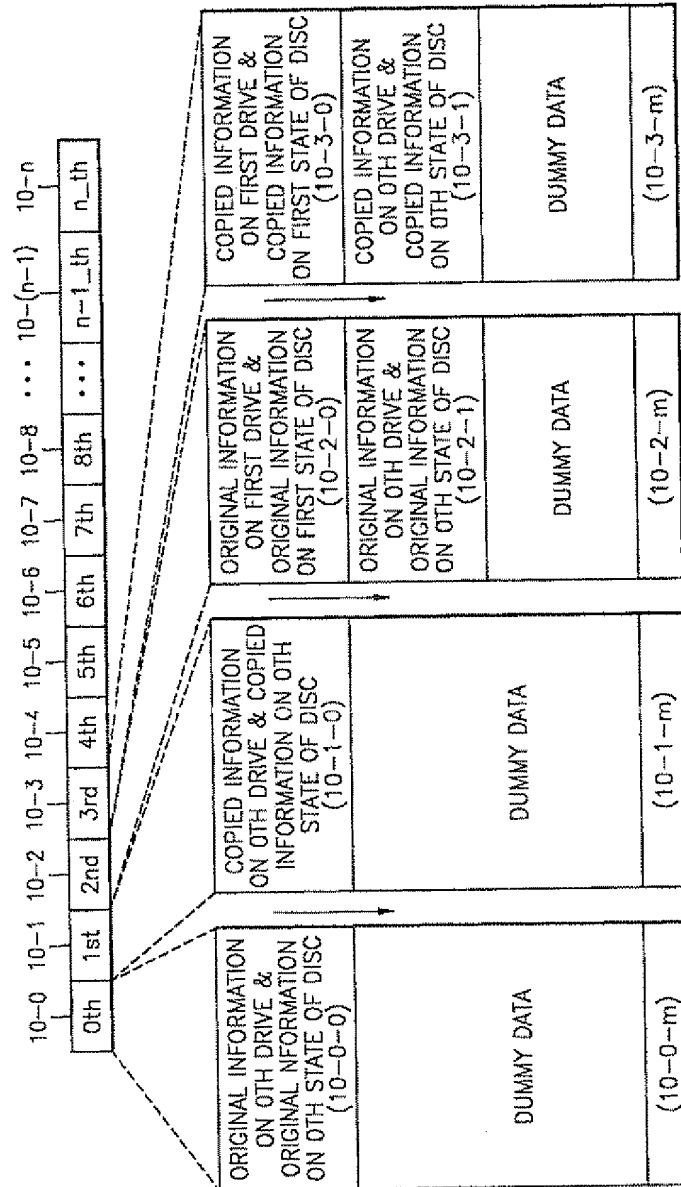


FIG. 5

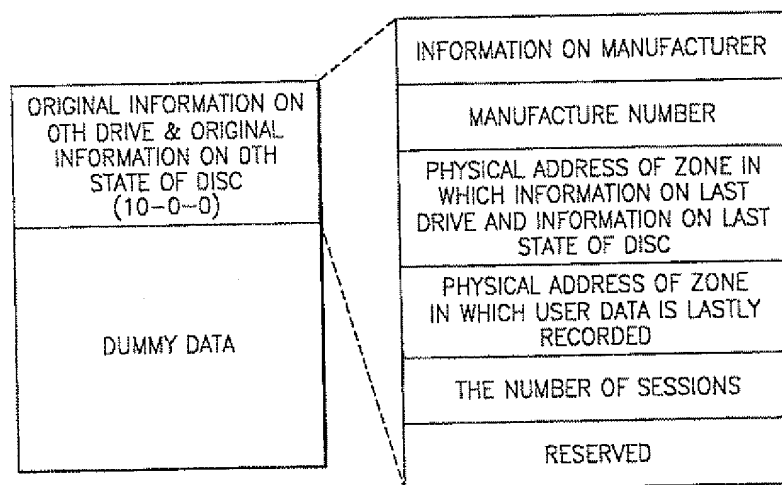
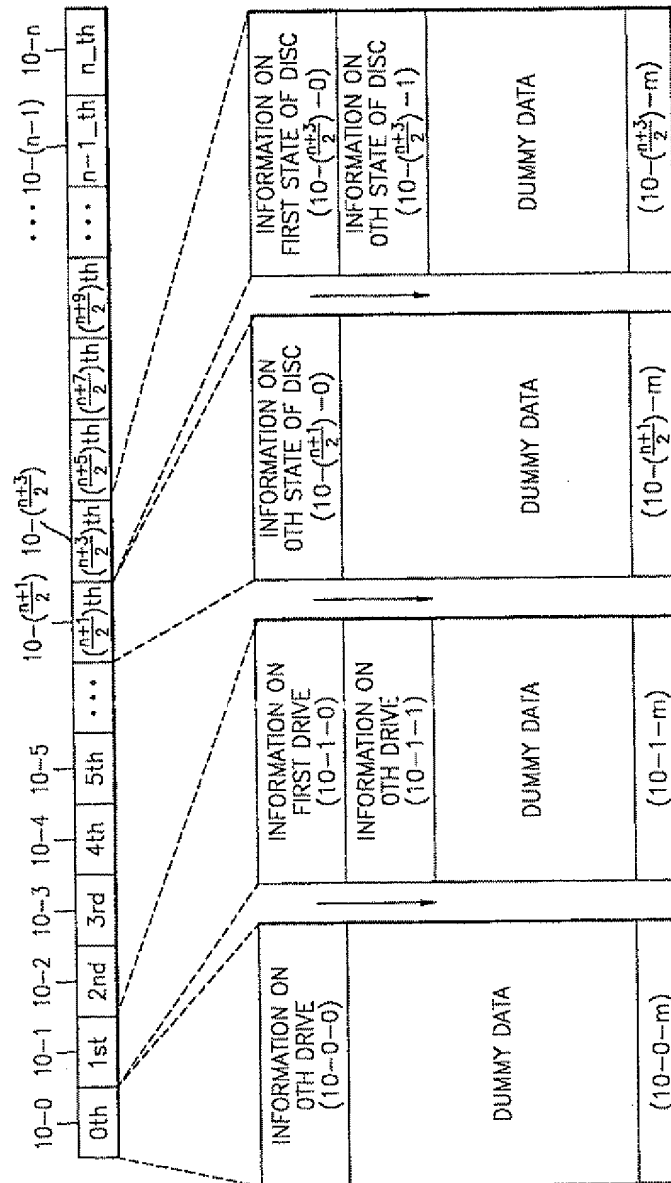


FIG. 6A

LEAD-IN AREA	DESCRIPTION	USE PURPOSE
READ-ONLY ZONE (5)	PITS OR HIGH FREQUENCY WOBBLES	DISC-RELATED CONTROL DATA
RECORDABLE ZONE (10)	DMA (10c)	DEFECT MANAGEMENT
	CONTROL DATA ZONE (10b)	DATA INFORMATION (CONTROL DATA)
	OPC TEST ZONE (10c)	OPC TESTING (OPC DATA)
	DRIVE & DISC ZONE (10d)	DRIVE-RELATED INFORMATION
		DISC STATE-RELATED INFORMATION
	BUFFER ZONE (10e)	BUFFER FOR USER DATA ZONE

FIG. 6B



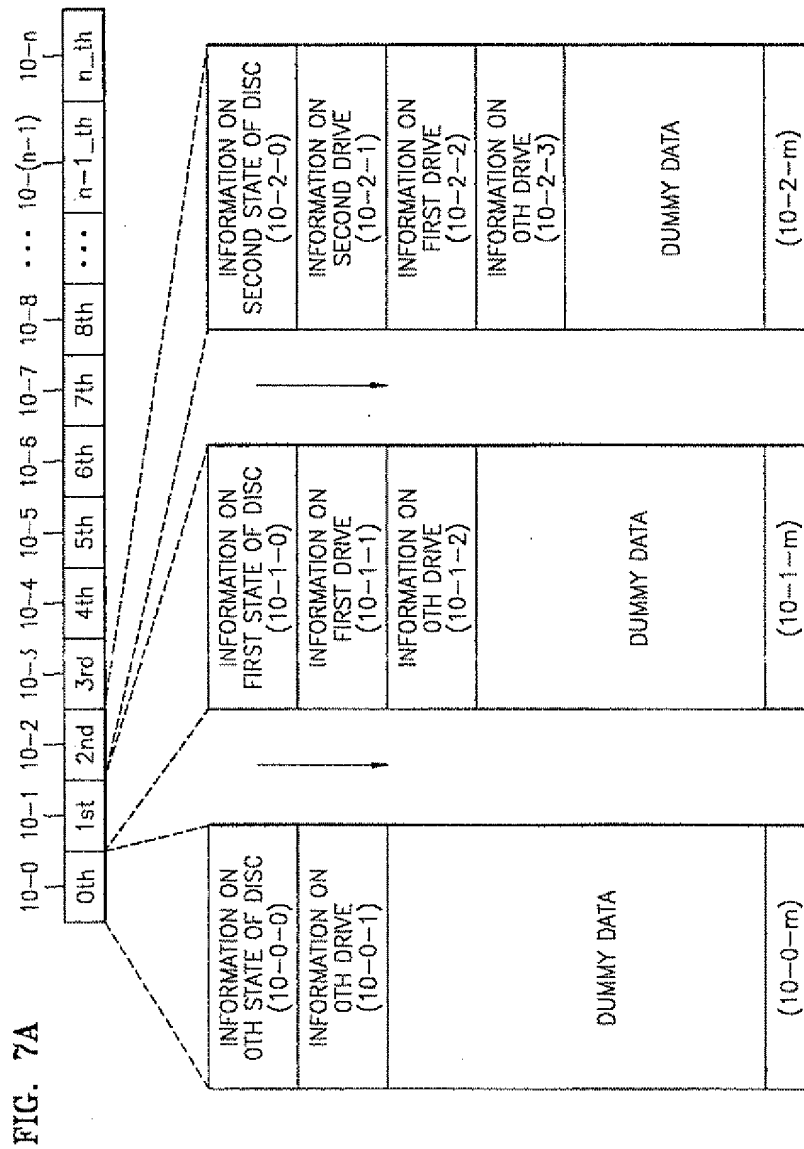




FIG. 7B

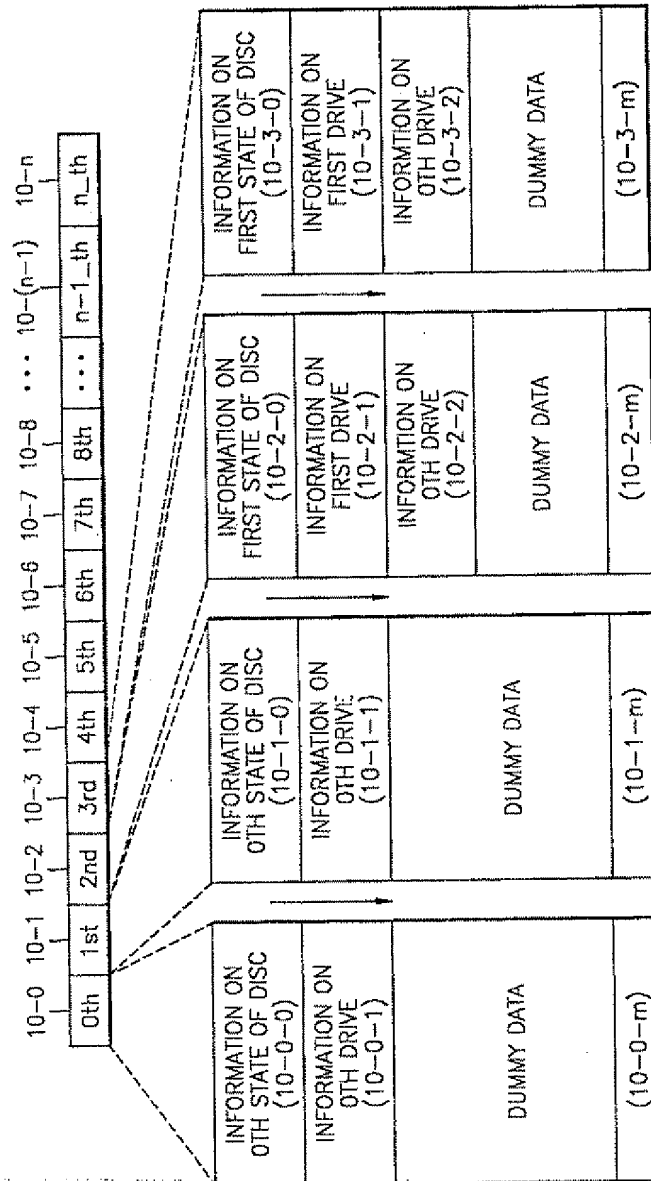


FIG. 8A

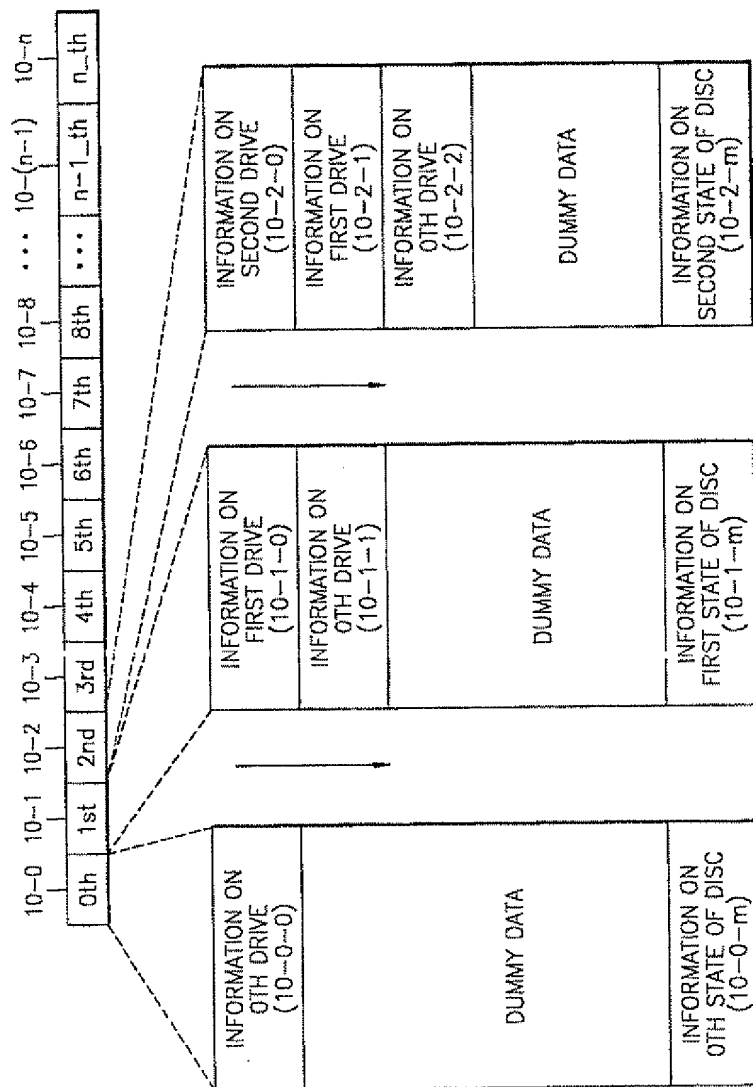


FIG. 8B

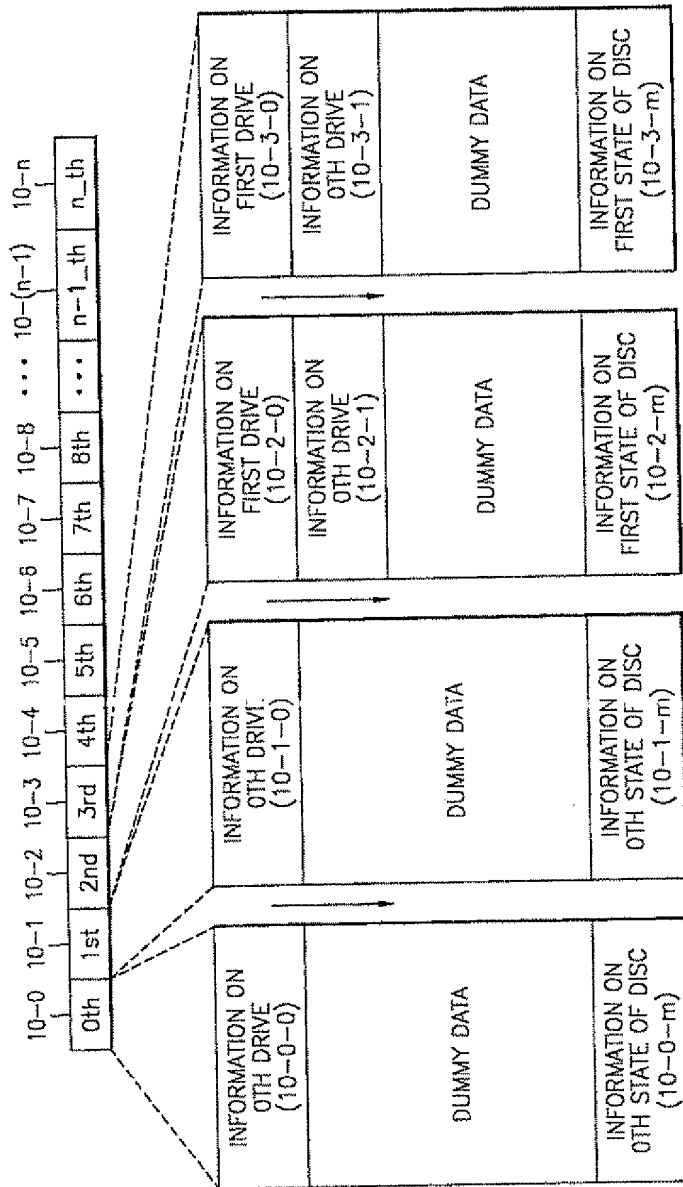


FIG. 9

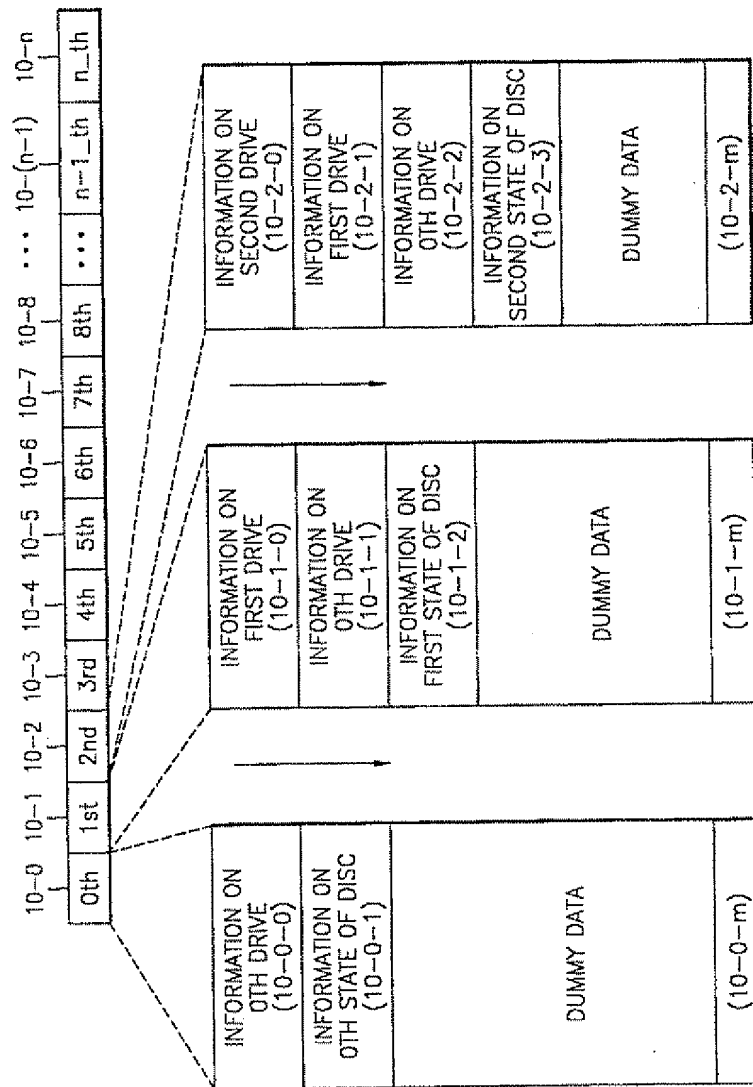


FIG. 10A

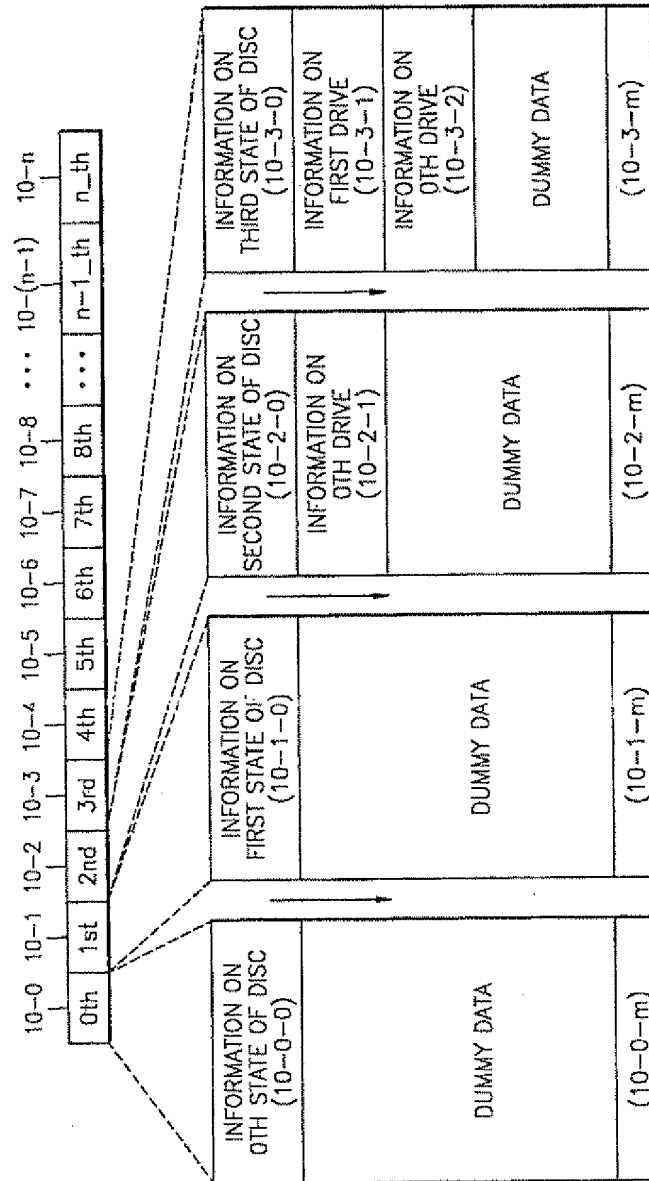


FIG. 10B

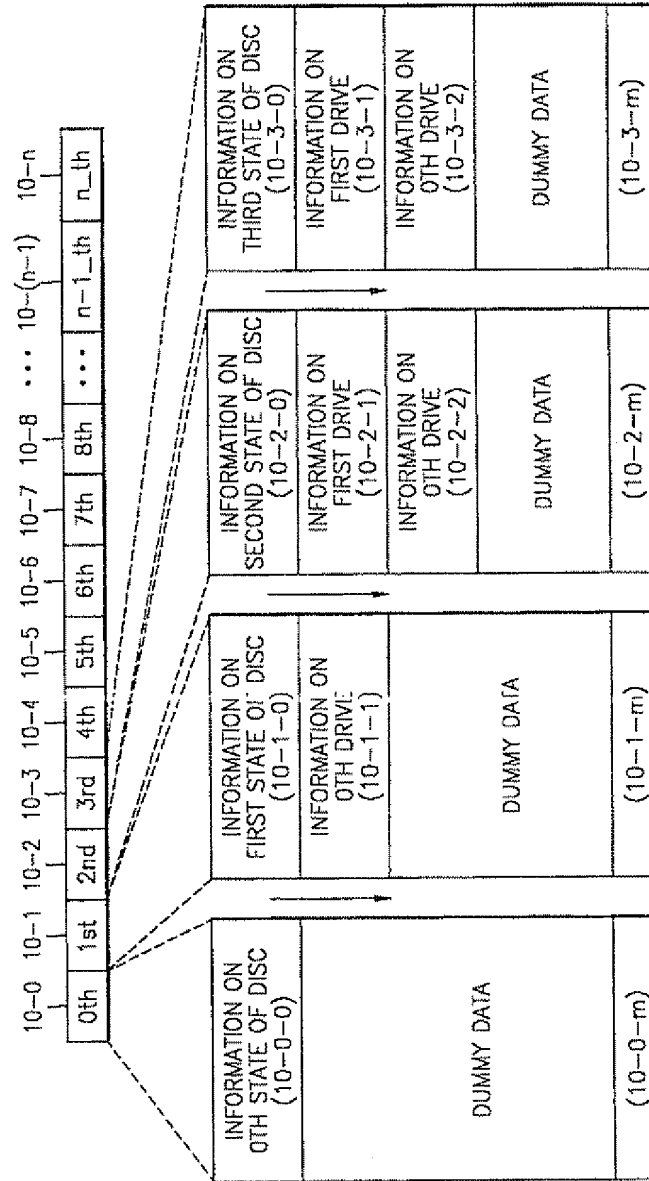


FIG. 10C

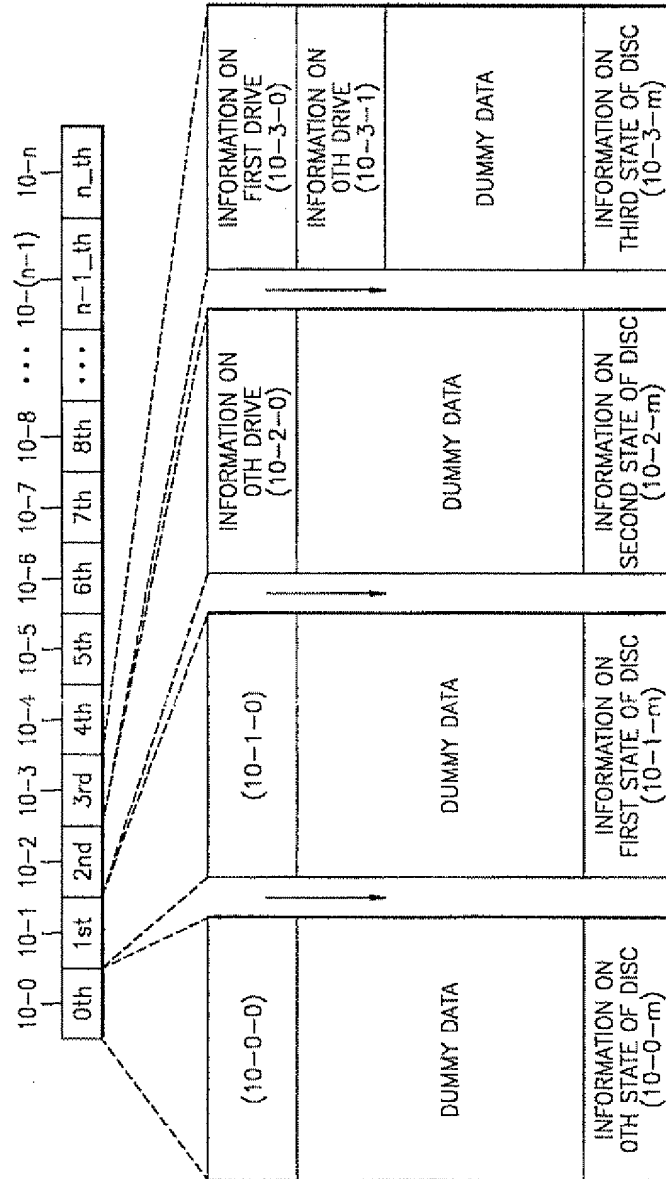


FIG. 11A

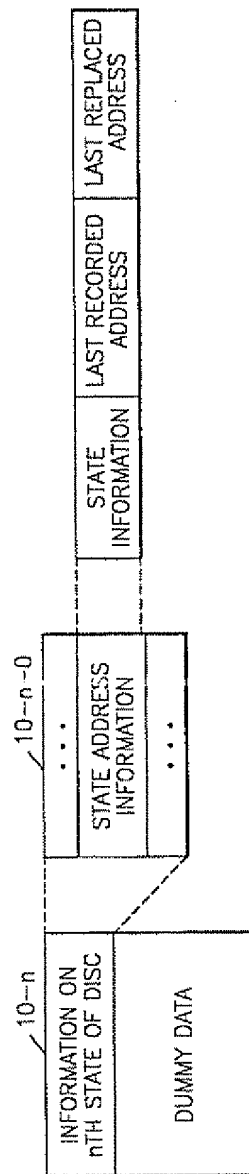


FIG. 11B

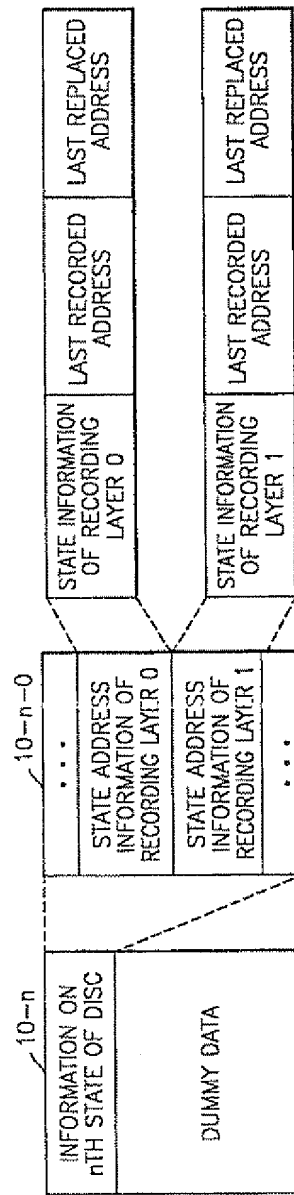




FIG. 11C

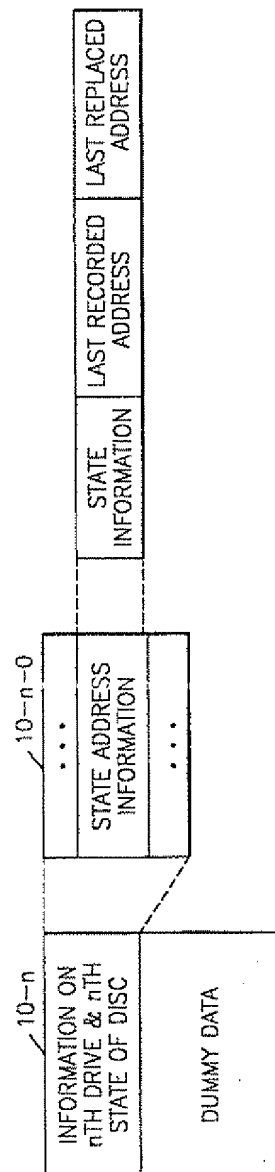


FIG. 11D

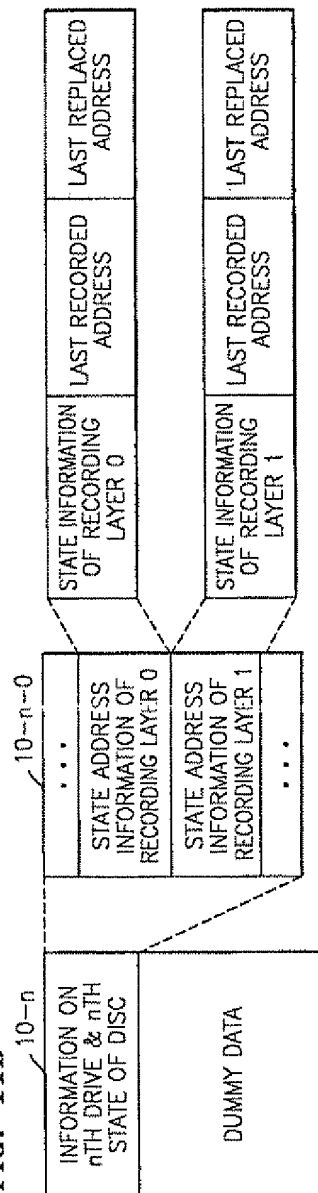


FIG. 12A

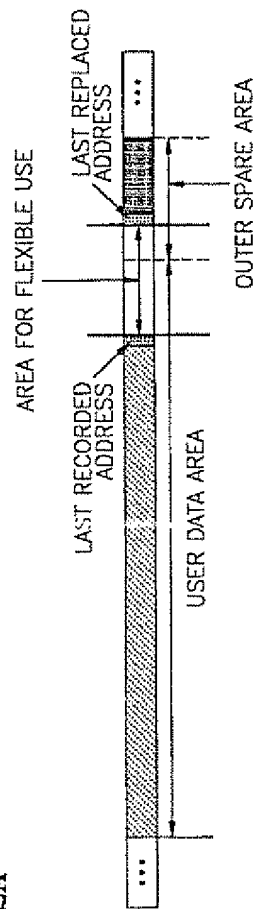


FIG. 12B

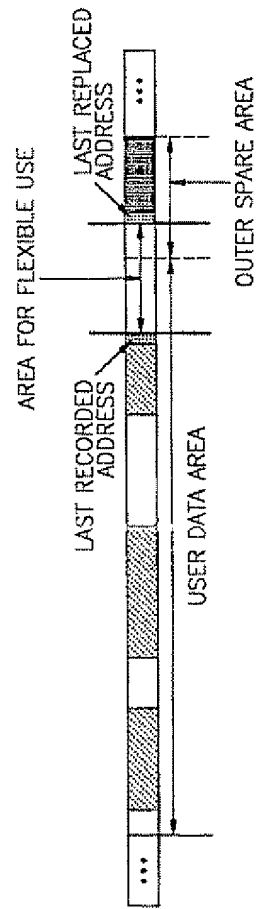


FIG. 13A

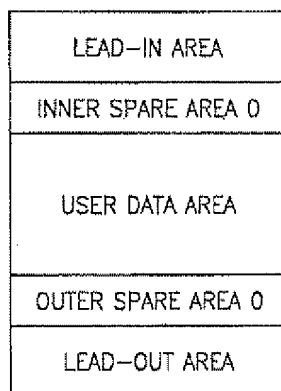


FIG. 13B

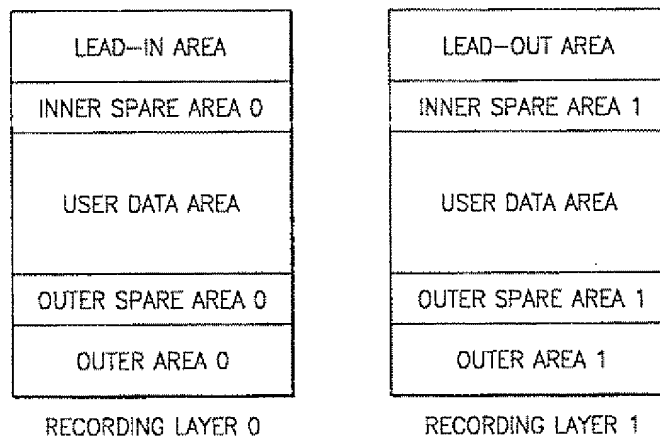


FIG. 14A

8BITS	28BITS	28BITS
STATE INFORMATION	LAST RECORDED ADDRESS	LAST REPLACED ADDRESS

FIG. 14B

4BITS	28BITS	4BITS	28BITS
STATE INFORMATION 1	LAST RECORDED ADDRESS	STATE INFORMATION 2	LAST REPLACED ADDRESS

FIG. 14C

8BITS	28BITS	28BITS
STATE INFORMATION OF RECORDING LAYER 0	LAST RECORDED ADDRESS	LAST REPLACED ADDRESS
STATE INFORMATION OF RECORDING LAYER 1	LAST RECORDED ADDRESS	LAST REPLACED ADDRESS

FIG. 14D

4BITS	28BITS	4BITS	28BITS
STATE INFORMATION OF RECORDING LAYER 0	LAST RECORDED ADDRESS	STATE INFORMATION 2 OF RECORDING LAYER 0	LAST REPLACED ADDRESS
STATE INFORMATION OF RECORDING LAYER 1	LAST RECORDED ADDRESS	STATE INFORMATION 2 OF RECORDING LAYER 1	LAST REPLACED ADDRESS